

Dear Benefactor,

This is a report from the Peru Crew January 2001. Having less access to e-mail this time than in the past (we spent most of our time away from any internet portals), we've chosen instead to take a few days and get all our reflections together before sending them off to you.

We left for Peru on Monday, January 8, 2001, and returned on Tuesday, January 23.

This project is not exactly linear chronologically, so it may not be easy to tell you everything in a nice and systematic way. It's all in here, one way or the other.

Okay, so who went? **John Duffy**, Professor of Solar Engineering, and **Father Paul Soper**, Catholic Campus Minister, U Mass Lowell.

Adarsh Das is a first year grad student in the Solar Engineering program. He has come from India to UML specifically to study solar engineering. He has a background in energy engineering, and came to UML after working in India with Harish Hande, a former UML solar student. He worked on circuits for signal conditioning for the data loggers we installed and on a variety of other tasks during the trip.

Jeff Pare is a senior in Mechanical Engineering. He lives in Boston, and commutes to UML. He brings a variety of skills to the program. His task during the project was to work on the micro-hydro system in Malvas, although, like everyone, worked on a variety of things. His capstone design project will be to design and install another microhydro system in Malvas or Cochapeti.

Kristen Kerouac (yes, she is a relative) is a junior in the Atmospheric Sciences program. She came on the trip in order to begin a study of the weather of the region. She has a strong interest in broadcast meteorology.

Jonathan Martin is a junior in English Literature, with a strong background in computer science. He came on the trip to work with the computer communications system.

Stephen Scaffidi is a junior in Computer Science. He also came to work on the computer communications system.

James Geggis just finished his undergraduate degree in Criminal Justice, and is preparing to start in the grad program. He was the equipment manager for the trip, and helped out with general things.

Jan Hansen is a graduate student from a university in Denmark. Jan spent the first part of the fall semester at UML working with Professor Duffy in preparing for the trip. In late October he and his wife Maria, who is Peruvian, and their two children went down to Peru, where he worked on that end, visiting sites and acquiring local equipment.

This completes the UML part of the team. Now for the Peruvian part ...

Father Charles Stanley is a priest from the Archdiocese of Boston, who has spent some 20 years or so working in Peru and Bolivia.

Pepe Basilio is a resident of the valleys in which we have been working for the last several years. He was, up until recently, an employee of the parish, but now works in Chimbote. He is very adept mechanically, and knows everyone in the valley, which is of inestimable value.

Jose Basilio is Pepe's son. He has a degree in electrical engineering (27 years old). He has a position with Telefonica Peru and spent his vacation time working with us.

Juan Pablo Trelles, graduated in December in mechanical and energy engineering from UNI, La Universidad Nacional de Ingenieros, in Lima. Through Alfredo Oliveiros, a local alternative energy engineer and instructor at UNI, Juan Pablo became interested in joining our team.

Peter Lavaleta is also a recent graduate in mechanical and energy engineering from UNI. Both Peter and Juan Pablo are interested in coming to UMass Lowell to study solar engineering as graduate students, a possibility which we are actively exploring.

The two weeks before leaving Lowell were spent in a frenzy of activity. Jon and Stephen slept only in spurts, and then often on the floor of the Catholic Center or with their head down on the bench in the Kitsen 107 lab, trying to get their computer communications material all together. James visited every Radio Shack in Eastern Massachusetts and Southern New Hampshire. Jeff got calls every afternoon about what to pick up at the electronics supply store near where he works in Cambridge. Kristen prepared her questionnaires, and Adarsh his circuits. Pizza was the only known food, and sleep was a rare event.

The day finally arrived to leave. We packed up our SEVENTEEN bags of equipment (including a ski bag for the antennas). A couple (eight, actually) were the tiniest bit over the 70 lb. weight limit for the bags (one weighted 120 pounds) – a fact which the American Airlines agents finally agreed to overlook after we smiled, blessed, begged, wept, and, in the end, made it clear by our persistence that if they were ever to get rid of this troublesome group, they would have to give in.

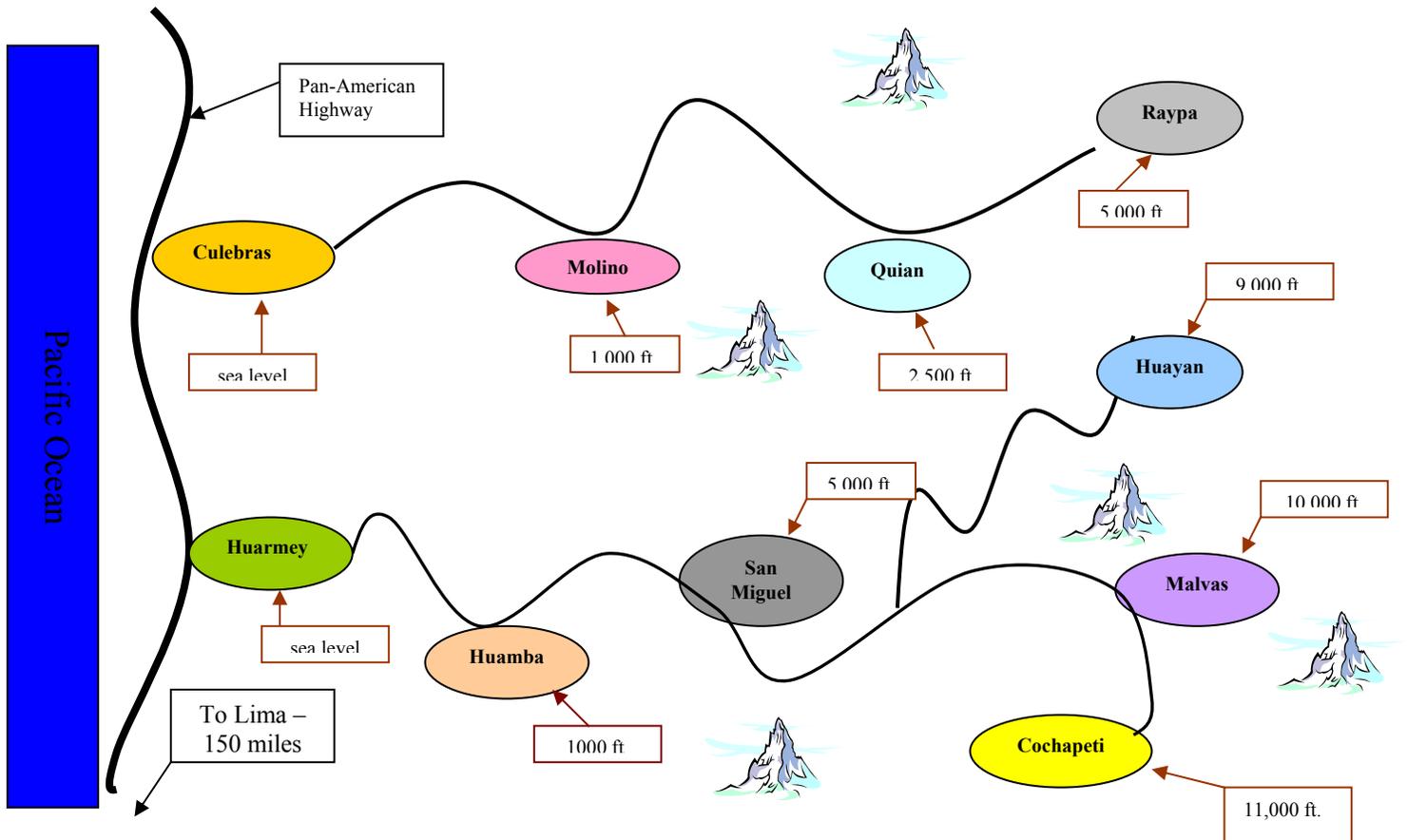
The flight to Lima went off without incident, but we had something of a nasty surprise waiting for us at the other end. Adarsh, from India, was not to be allowed into Peru – he lacked a passport stamp that Peru requires of Indians (and not of Americans – in fact there are only a handful of countries in the world of which Peru requires a visa, and India is, unhappily, one of them). So, Adarsh had to get back on the next plane to the States. Forty-eight hours, five cities, and about 10,000 miles later, Adarsh was back in Lima – he had the necessary papers, and American Airlines covered the expense of his travel.

In Lima, Professor Duffy gave a presentation on solar engineering and alternative energy for rural development at a round table for the students and faculty of UNI, La Universidad Nacional de Ingenieros. Some forty or so participants attended the workshop. Jeff, from our group, attended as well. At UNI, Professor Duffy met up with Juan Pablo and Peter, and made the final arrangements for them to come along with us on the project.

While the UNI conference was going on, the rest of the team scoured Lima for the remaining equipment – stuff that could not be carried on the plane due to size or hazard – things like butane for the soldering irons, lightning rods, and deep cycle batteries. We also wanted to find a guitar (an old, used one) for us to use on the trip (Steve is an excellent guitarist) and to give as a gift to the students in Malvas. Finally, we wanted to find some CD-ROM's in Spanish for the computer we would be putting in the school. The butane, guitar, and CD's were proving stubborn – a morning's search was fruitless. After lunch I (Paul) headed out again, and finally came across a very, very helpful taxi driver – he knew how to find anything and everything in Lima, and his cousin had an old guitar he was selling. Much more so than in the States, this is the way the economy works in Peru. You find people who know what they are doing and how to find things, and they assist you.

In Lima we picked up three people (Peter, Juan Pablo, and Jan Hansen), about another ton of equipment (including ten pipes for repairing the micro-hydro, each 3 inches across and about 12 feet long, batteries, and some fairly large solar parabolic dishes). Somehow or another all of this stuff got to the bus station, where we hired a truck to drag it and us up to Huarmey – about 150 miles along the Pan-American highway.

Here is a little map showing the region near Huarmey in which we were working:



In Huarmey, we installed a radio, amplifier, antenna, packet data modem, and computer running Linux in the parish house. This is to be our base station for the e-mail and data logger communications. Each night, the station in Huarmey will query the data loggers in Malvas and Cochapeti for their data, via radio and packet data modem. Whether successful in collecting the data or not, the computer in Huarmey will bundle the script of the communication into an e-mail and send it off, via an ISP they have available in Huarmey, to Lowell.

While we were in Huarmey (both at the beginning and the end of the trip), we stayed in the most wonderful place – a little cheap (by our standards) hotel down by the beach. Some of the kids swam in the Pacific, and all were charmed by the setting. One could see the ocean in the west, and the mountains looming in the east, calling, calling – well, at least that’s how it seemed to some of us. It shows some of the extreme diversity of the climate of this country – we were at the ocean, in a desert, with mountains in view where it was pouring rain, and jungle just on the other side of the mountains.

Now we will switch from a chronological description to a geographic one. You can follow along with the map.

In Huamba, we checked on the current installation in the medical post (radio, amplifier, batteries, charge controller, panels, overhead lights, exam lights, portable lights, vaccine refrigerator). Communications from Huamba had been difficult, so we installed a large Yagi antenna at the post. This cleared up the problem pretty well.

In San Miguel, we checked on the current installation in the medical post. In addition, we installed a system in the church house (the church itself was badly damaged during the 1998 El Niño phenomenon, and is in the process of being built). The Church house is a common gathering place for the community. This installation consisted of a 50 W PV panel, a charge controller, a battery, and a 20 watt fluorescent fixture. This installation will be transferred to the Church when it is completed. Funds for church systems are from donations from several parishes in the area around here.

In Malvas we worked in five different sites.

At the medical post we gathered the data from the data logger that had been gathering data for about a year. The data logger is a Campbell Scientific CR10X. It has twelve single-ended voltage measurement channels, and pulse and frequency counters. We use it to measure temperature, and the current and voltages in the system. Once an hour the data logger records averages from across the hour (it queries the system once every few seconds). It also gives us daily summaries of highs and lows.

We checked on the current system of radio, amplifier, antenna, batteries, charge controller, data logger, vaccine refrigerator, water purifier, ice maker, overhead lights, exam lights, and portable lights. We installed a pyranometer on the clinic roof, which will measure the amount of solar radiation, and connected it to the data logger. We put in a laptop computer, in the hopes that in the better weather a TCP/IP connection with Huarmey could be established, allowing e-mail communication. We raised a small Yagi antenna on the roof to replace a damaged one. We added a high/low temperature alarm to the refrigerator.

At the school we improved the battery charging station already in place by adding 50W of panels to the system. We added 50 W of PV to one of the battery charging stations in the school along with a battery and charge controller and converted it to supply power for a laptop computer and overhead light we installed in one of the school rooms.

We installed in the Church in Malvas 50W of PV, two 20W fluorescent lights, with a charge controller and battery.

Malvas is the site in which we have the micro-hydro installation, and we improved that, replacing the original tubing with 3-inch, 140 p.s.i. pipe running down the entire chute. We also installed the electronics for a second charging station to be run off of the same turbine. The water going into the turbine runs through channels put in place in pre-Inca times (i.e., more than 500 years ago).

Finally, in Malvas, we put three fluorescent lights into a small house (one in each room) which is being converted for use as a dormitory for high school students who currently have to walk from a nearby (2 hours by foot) village. They leave at 5AM or so, and arrive at school by 7AM, leave

again by 2PM, arriving home by 4PM. This schedule leaves them no daylight time to study. The dormitory will allow them to focus more on their studies than on the walking.

Next up the valley is Cochapeti. There we installed a new data logger (a Campbell Scientific CR10X – like the one in Malvas). In addition to recording voltages, currents, and temperatures, this data logger is also measuring wind speed and rainfall, using two new Davis Instruments devices we installed on the roof (actually, the wind speed device had to go up on a tall pole). It also will measure the incident solar radiation using a pyranometer (Kipp-Zonen). We added a high/low temperature alarm to the refrigerator. As in Malvas, we hooked the data logger up to a radio modem in order to get it to transmit its data down to Huarney, to be bundled in an e-mail and sent to Lowell. We also left in place a system for e-mail from a laptop via the same radio pathway.

The small radio system in Huayan was not working adequately, so we replaced it entirely – a new radio, amplifier, and Yagi antenna. It now works very well.

Malvas, Cochapeti, and Huayan are all above the “rain line.” It had already been raining there for several weeks, and the rained increased steadily in intensity during the eight or so days that our group lived and worked in these communities.

Now the soil in Malvas has a very high clay content. And, clay, when soaked for days with rain, turns into the most amazing material – mud which is both sticky and slippery at the same time. Mud was everywhere (not to be indelicate, but it wasn't just mud – it was also other mud-like substances, since Malvas is an agricultural community, and the animals roam freely through the town). Mud was on our boots, between our toes, in our hair, covering our clothes, under our fingernails, and, well, everywhere. It was impossible to stay clean – if you washed and scrubbed and got yourself all nice and mud-free, as soon as you slipped and fell (which for some of us was several times per hour), you were back in the same situation.

And yet, combined with the mud, we witnessed some of the most beautiful sunsets and vistas imaginable – in fact, they are not really imaginable, since the human mind doesn't extend that far into the subtle beauty of creation. Lights, colors, clouds, sun-rays, rainbows - the common backdrop to the really difficult life these people live in this most spectacular of places.

At one point, James and Father Paul were down at the clinic in Malvas (and we really mean down – anywhere you walk in Malvas, you walk up or down – to climb from the clinic to the school was easily a climb of 400 feet, in practically no oxygen), anyway, Father Paul and James were at the clinic and a really spectacular sunset was underway. Steve had left his camera at the clinic, and comes running down the mountain to grab it to get a shot of this event. Out the window of the clinic all we saw was rolling and sliding by – he had made it most of the way down, but tripped at the last moment, and rolled and slid the last 100 feet to the clinic door. He got his picture.

Now for the other valley – Molino, Quian, and Raypa.

In Molino there had been just a small hand held five-watt radio with a whip antenna. We replaced the whip with a Yagi, and added a 35-watt amplifier to the radio.

In the medical post in Raypa we installed a new vaccine refrigerator – a smaller, more efficient model – and included a high/low temperature alarm.

The parish had hired a contractor to put solar panels on the parish house in Raypa, which the contractor did, but we added lightning protectors, grounding stakes, and circuit breakers to improve the safety of the system. All of the systems we install include these components.

In Quian, we replaced the radio system, as we had done in Molino. In addition, we added a 20W fluorescent light into the delivery room, and a high/low temperature alarm to the refrigerator.

In every community we visited, we left a gift of soccer balls, volleyballs, and pumps for the balls. As soon as the balls were presented in Quian, a game broke out – spontaneously, as kids from the town are on their “summer” vacation now.. It was great to watch.

From the above, it is obvious that a major emphasis on this trip was the improvement of the radio communication system – a fixing up of stations that were too weak, and the attempt to add data communication from Cochapeti and Malvas. So how is it working? The voice communication on the radios is excellent – worlds better than before (and this is the most important component). It is more reliable, and works even in the relatively poor atmospheric conditions that exist right now (the heavy, nearly constant rains at the higher altitudes). The data communication is sporadic. The stuff is in place, and we will watch it through this semester. It is set up so that we can do some tweaking of the system from here in Lowell (by dialing into the Linux box in Huarmey). During the heavy rains that are so frequent now, voice communication is filled with static (but understandable). The data packets are having a tough time breaking through that – sometimes they do, sometimes they don't. It has always been our intention to someday make that a satellite based system – we weren't ready to do so on this trip. Our experience with the system in the coming months will tell us whether we need to move in that direction.

Before the next trip, we are focusing on developing our vaccine refrigerators. We made some breakthroughs in the fall in terms of increasing the efficiency of the thermionic modules through a better control algorithm. Several students will be working on designing and manufacturing improved versions of the refrigerator. Four senior ME capstone students are designing, and will install, another microhydro system, probably in Cochapeti. In addition to our own UML students, we have interest from an engineering student in France and one from Dartmouth College (a classmate of Ryan Duffy, who spent ten weeks last fall volunteering in the clinics in Malvas, Cochapeti, and other towns where we have our solar equipment) to spend the summer working with us on this project.

We would like to include one additional reflection. A major advancement for us on this trip was the extended working relationship with the students from UNI. Peter and Juan Pablo very quickly became an integral part of our group. I (Paul) watched the students say good-bye to one another at the airport, and was struck by how quickly that relationship formed, and how important it became. There are all sorts of reasons to do a project like this. Some involve

assisting the people of a developing nation through cooperative development. Some involve service-learning for students studying in Lowell. But we are also in the business of character development – forming our UML students to be good, solid people – people of compassion, of broadness of mind, of strong intellects and strong hearts. We feel that the formation of a bond between students from Lowell and students from Peru is one of the best and most effective way that kind of formation can happen, and there is nothing that forms a bond faster than working very hard in difficult conditions for two weeks – laughing at the mud which constantly covered us from head to foot – eating together and sharing a tiny room – dancing and celebrating and worshipping – a bridge is formed which will not soon be broken.

It is our real hope that someday soon, not as an addition to the work we are doing in Peru but rather as an integral part of it, we can have some of the students from UNI come and pursue graduate work at UMass Lowell. Peter and Juan Pablo have both expressed a serious interest in this – to come to UML to do graduate study in solar engineering.

We got every one home safely. Steve picked up a parasite (we call them his little Peruvian friends). James got bronchitis, and Kristen a rash, and we were all pretty tired, but all in all we felt great about the experience.

Now we would like to add in some reflections and stories written by the students about their experiences:

Here is a reflection composed by Kristen Kerouac:

Two paragraphs... trying to fit my entire Peru experience into that length of a piece is a tall order. But I think I can do it. Being a part of this service-learning project has taught me that I'm capable of much more than I ever imagined before I accepted the challenge of service work in Peru.

One of my favorite personal stories that I like to tell over and over again speaks volumes about the Peruvian people. I was walking through a market place one day, with my money pouch around my waist, over which I wore a big shirt, to help keep the pouch secure. The shirt was also helping me to keep from getting any more sunburned than I already was. As a matter of fact, I was actually walking through the market place searching for "locion para quemadura de sol"... soothing lotion for my sunburn I had acquired in the mountains, where there isn't as much atmosphere to block the sun's more harmful rays. Some women stopped me to comment on my rosy cheeks, and I thought they were talking about my sunburn. But then, they pointed to my stomach, and from what I could make out, they were telling me that they hoped I would have a beautiful and healthy baby! I lifted up my shirt to reveal the pouch, and we all had a good laugh before I continued on my way.

I could tell you about the weather station we installed, and the directed study I am going to do with the weather data we'll be getting from Cochapeti. I could tell you about how I learned to lay wire, so I could help bring electricity to the people in the mountainous villages of Malvas, Cochapeti, and San Miguel to name a few -- places that don't have such energy otherwise. I could tell you about how everyone in the group worked together to get the antenna in Huarmey

set up and functioning properly so to aid communication with the people in the mountains, who are sometimes cut off from the rest of the world when the rain washes their roads out. All of these things were significant parts of my experience. I believe that the most important part of the experience though was coming to know the people I was serving, like those women in the market place. Though I had come prepared with equipment and ideas to increase their quality of living, I think that, in a way, the people of Peru gave me more than I gave them. They showed me that no matter how little you have, if you have a considerate heart, you can draw on an abundance of kindness that can be readily dispersed and that can leave an impact on someone like me: a young, foreign woman -- a stranger for whom they wished health.

And a reflection by James Geggis – one he delivered to the people of Saint Rita's Parish in thanking them for the help they had given us:

Good evening everyone. My name is James Geggis and I am a Master's student at UMass Lowell/(slash) still asking my parents for money at age 23 type person because I love the lifestyle of a student, in case you all were interested.

I just want to start off by thanking Father Paul and you the parishioners for inviting me here at St. Rita's to speak briefly about our group's amazing trip down to Peru.

As most of you are aware by now, The Catholic Center and different members of the UMass Lowell community have teamed up to run an exciting service-learning experience that benefits not only the Peruvian people but students from the university that are applying things that they have learned in the classroom to the real-world.

A month ago, I was fortunate enough to be one of 6 students from UMass Lowell who traveled to Peru to install solar panels and communication systems. We were led by Professor John Duffy of the Mechanical Engineering Department and St. Rita's own Father Paul Soper. Not only is he an awesome priest, but he sure can pinch a penny when it comes to negotiating a taxi fare in the eternally congested streets of Lima. And you guys think the traffic in Boston is bad. HA!!!!

Some of my responsibilities on the trip included taking digital photos of previous groups and our groups equipment installations, general laboring, and most importantly I was the go-to guy for finishing the leftovers at mealtime. Not a bad days work, you think?

Kidding aside, my main responsibility before and during the trip was to acquire and keep track of all of our equipment. And boy, was there a lot of equipment! In all, our group took about 17 pieces of personal and equipment related baggage. The size and weight of some of our equipment duffel bags was just incredible. WOW!!!!

Thanks to the generosity of you, the parishioners of St. Rita's and other benefactors who supported the trip, we were able to purchase all the equipment necessary to make this a smashing success. We would not have been able to accomplish our intended objectives of improving the quality of life for these Peruvian people without your support and many prayers.

Finally, I want to end by briefly commenting on how this trip impacted my life of faith. I think God calls everyone of us to serve his people through our different skills and talents. On this

particular trip, I was clearly able to see the all the different people in our group use their God-given talents to serve others. Whether it was one person writing a computer program to retrieve valuable information from some of the remote health clinics or another person taking time out of their busy schedule to play soccer with the Peruvian children, someone from our group was always there to lend a hand. A hand that would benefit a Peruvian in some unique way.

And so, in conclusion once again we extend to you, and to all of our benefactors, our deepest appreciation for your support and concern for this project.

*Fr. Paul Soper
John Duffy
Jeffrey Pare
Adarsh Das
Kirsten Kerouac
James Geggis
Jonathan Martin
Stephen Scaffidi
Jan Hansen
Juan Pablo Trellis
Peter Lavaleta
Pepe Basilio
Jose Basilio*

(Contact information: Paul_Soper@uml.edu, John_Duffy@uml.edu)