

Day One

April 3, 2009 in Kathmandu

The first day of field experience with the digital radiology system got off to an inauspicious start. In the wee hours, unable to sleep because of the time difference, I discovered that the assembly in the suitcase had been damaged in transit, probably because the TSA agent had not repacked it correctly. It took a couple of hours, but I was able to fix the problem. Then the suitcase itself was damaged during a taxi ride in the morning. It already looks like it has gone through the wars, and the trek is yet to come.

The first stop of the day was the Nick Simons Institute (www.nsi.edu.np), where we met with Dr. Bruce Hayes, an Australian GP who has worked in Nepal for 16 years. Bruce had a badly sprained foot, so we lugged the x-ray suitcase up to his third-floor office to show it to him. He was excited by it and thought it would be a very useful tool in a remote clinic such as the one he had served for many years before coming to Kathmandu. I explained that I wanted to try it out in one or two sites in the Kathmandu valley before setting out on the trek, and he suggested we do it at Patan Hospital where he conducts a training program for rural health workers and where he has his clinical appointment.

After a spicy lunch of dal bhat, we arrived at Patan Hospital around 2:00. Bruce greeted us, with his crutches, and introduced us to the only radiologist there. He explained that we wanted to try out a digital radiology system. The radiologist was too busy to discuss it, but she told us to go ahead. With the help of a radiographer (radiology tech), we found a room that wasn't in use, and I began to unpack.

Evidently, the word spread like wildfire through the hospital that a DR system was in use, and in a couple of minutes the x-ray room was crammed with eager Nepalis, peppering me with questions (sample: How does DR differ from CR?) as I worked.

Within 10-15 minutes I had the system set up and was ready to shoot the breast phantom, when Bruce jumped on the table, put his injured foot against the screen, and said "shoot this instead!" I still didn't have the computer set up, so I did that as quickly as I could with five or six people crowded around me in a tiny control room. Somehow I did everything right, and up popped a picture of Bruce's foot.

At that point the curiosity turned to a frenzy. Everyone wanted me to show them what I could do with the image. I had to run it through Photoshop to convert it to black and white, then through ImageJ for further processing and display, and in the turmoil I couldn't figure out how to do much of anything. Then someone pointed out that there was a line of patients waiting to get into the room, including a baby in its mother's arms. I shot a picture of the breast phantom, then threw everything into the suitcase and vacated the premises.

By this time Bruce was off to teach a class for rural healthcare providers, and the only place I could find to work was on a bench in a bustling patient reception area. In this

relative calm, I was able to figure out the processing steps, but as soon as the image appeared several curious patients were peering over my shoulder.

Per his instructions, I then went to Bruce's classroom, explained to the students what I was doing, and showed them the image. There was general enthusiasm for the project and a good discussion on how the system might prove useful in the villages (more on that after I get some more inputs). It was also the consensus of the group that Bruce did not have a fracture, though one had been suspected on the basis of earlier radiographs. The DR image had the advantage that it was two weeks after the injury, so a fracture would have been more evident because of callus formation.

Here is a dumbed-down jpeg version of the image (< 1 MB compared to 24 MB raw):



Some technical points: At the radiographer's suggestion, I used 50 kVp and 6 mAs. I set the camera at ISO 2000, F/1.4 and an exposure time of 10 sec. A couple of seconds after opening the shutter, I signaled the radiographer to shoot the x ray, and there was no difficulty in the coordination. Because of the hubbub, I used the same mAs for the breast phantom, though we had used 25 in UMC.

Back at the hotel, we met with the head of our trekking company, and he agreed to assign an extra porter just to carry our battered x-ray suitcase. The trek will pass two regional hospitals with x-ray facilities, so I should be able to relive today's wild ride.

Next stop: Tribhuvan University Teaching Hospital on Monday.

Weird word of the day: yarchagumba (http://en.wikipedia.org/wiki/Vegetable_caterpillar)

Day Two
Monday, April 06, 2009

If Day One began inauspiciously, Day Two began harrowingly. The ruling Maoists called a bandh (general strike), and all public transport was halted. We were due at Tribhuvan University Teaching Hospital (TUTH) at 12:30 but had difficulty finding any taxi willing to take us there. Finally we found a driver who would do so if we paid double the usual fare – he said he was worried about his taxi being hit by stones. In fact, halfway to the hospital, we found ourselves in the midst of a sea of chanting young people waving hammer-and-sickle flags and Che Guevara pennants, but the hordes flowed smoothly past our taxi with scarcely a glance. Still, when time came to leave, our hosts were sufficiently worried that they arranged for us to return to our hotel in an ambulance.

The hospital was a typically depressing third world scene, the ill and injured roaming seemingly randomly through the corridors and waiting rooms. After considerable confusion, we finally found our way to the radiology department, where we had a whirlwind tour before going to the seminar room. The department was well equipped, except that most of the equipment didn't work. They had a Siemens MRI that hadn't worked for two years, and they had given up long ago on operating a nuclear medicine department. One of the problems there was that their Israeli isotope supplier could not ship with any of the Asian airlines.

I gave a pretty standard talk on molecular imaging at CGRI, but I added ten minutes at the end on what I called GhamiCam – to the delight of the audience. I closed my talk with a bullet list of Next Steps:

- Get more phantom images in Chame, Jomsom, elsewhere
- Find interested partners in Nepal
- Get permission for initial human studies
- Look for Nepali companies or NGOs capable of building multiple copies
- Provide training for rural health personnel

The response was overwhelmingly enthusiastic. TUTH is the leading governmental medical center in Nepal, but it lags far behind the private clinics, and it has no digital radiology at all. They immediately invited me to image some of their patients. I demurred, saying that I was worried about the ethical issues and the need to get informed consent. Two people in the audience then identified themselves as the author of the country's ethical guidelines and the current head of the nationwide IRB, respectively. They assured me that the request would be approved expeditiously.

The overflow audience in the seminar room then went, seemingly en masse, to one of the x-ray rooms, where they proceeded to “help” me with every step of setting up the system. Amazingly quickly, the system was operational and I took the first exposure of the breast phantom with at least a dozen people still in the x-ray room. The image came out great, and there was no stopping the momentum! One of the staff went over and put his hand on the system, and that image came out very well also. Before I knew it, a bewildered, ambulatory patient with a badly mangled finger was dragged in, and his hand too went onto the system; whether it was with consent of any kind, much less informed, was never clear to me.

At this stage I did slow down the proceedings, in no small part because I am still quite shaky on how best to process and display the images – it seems that everything I do leaves the gray-level histogram poorly sampled over some of its range. I pleaded that I needed to get back to the hotel to work on the processing, and the assemblage accepted this explanation on the promise that I would come back tomorrow. They are holding the suitcase hostage.

Stay tuned!

Harry

Day Three

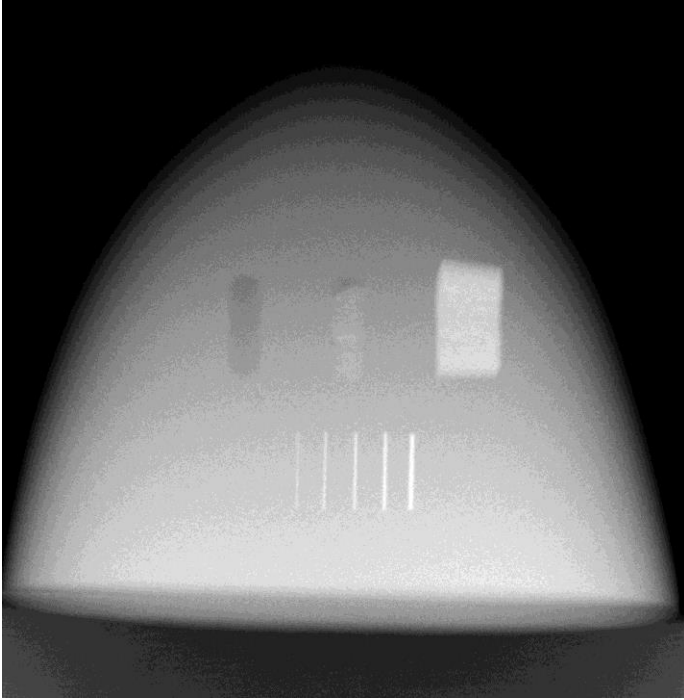
Tuesday, April 07, 2009

I seem to be concocting adjectives to describe the beginning of each day in the clinic. The beginning of Day One was inauspicious. Day Two was harrowing. The best way to describe the beginning of Day Three is effervescent.

I was picked up at 10:30 by the head of the Radiology Department at Tribhuvan University Teaching Hospital, Dr. Sunil Pradhan. No sooner had the door of the car closed than he started bubbling over with enthusiasm. I had sent him the processed hand images, and he was very excited about them, saying they were better than he ever sees in the clinic. He and his staff had been making all sorts of plans to construct a robust DR box for Nepali villages. He said that he was initially reluctant to get into radiology because he wanted to use his medical skills to help the poor, and the poor in Nepal have very little access to medical imaging of any kinds. There are 75 districts in Nepal, each with a district medical post, but only 15 of them have a radiologist. Now, at the ripe old age of 51, he sees our system as one last chance for him to extend the reach of his profession into the villages and benefit the poorest of people in one of the poorest of countries.

The staff had been busy indeed. They were already designing a closed box with the camera sliding on a rail to vary the magnification, and they had started looking into the availability of inexpensive cesium iodide screens from India. They were also investigating ways of simplifying the image acquisition and processing and of training rural health personnel. By the end of the 15-minute car ride, he was already talking about ways of getting the necessary local funding and approvals to get the project off to a flying start.

Once inside the hospital, I added to the fever by showing the image below of the breast phantom, which also greatly impressed him and the other radiologists who joined us.



I suggested we try to get a comparison image on one of their systems, so we took the phantom to the mammo suite, which was outfitted with quite a modern Hologic system. I suggested we use 50 kVp for the x-ray energy and 5 mAs for the exposure, as I had for the image above, but the Hologic system went only to 35 kVp, so they insisted on running it in automatic mode to get the optimum image. Predictably, the Hologic computer railed the kVp at its maximum, then ran the exposure up to try to get enough photons through. The final exposure was 130 mAs! This was adaptive imaging run amok. Instant fried breast of patient! And the image was still awful, with very little exposure in the thick regions.

At this point they belatedly took my advice and exposed the phantom at 50 kVp and 5 mAs on a film cassette with two 400 speed screens (our image was with a single 400), and the image was underexposed but respectable. Clearly the dynamic range of the film is not up to imaging a phantom representing an uncompressed breast 9 cm thick at the chest wall. I'm sorry I don't have a digital version of the image to send you but – hey – that's why I'm here!

Over coffee in the reading room, we continued the discussion of making and disseminating a practical system, but we were interrupted by a parade of university dignitaries coming by to ensure me of their support. We ended by agreeing that they would do much more homework during our trek and that we would meet again on the morning of April 29 – with our flight to Japan scheduled for 6:00 PM that same day.

No matter what happens from here on, the professional aspect of this trip has been a rousing success. If we also make it over Thorung La, it will be golden (pun intended) all around.

Day Four
Wednesday, April 08, 2009

Cathy and I were picked up by our guide, Jeewan Shrestha, at 9:30 and taken by taxi to the Engineering Campus of Tribhuvan University, and at 10:30 I began a lecture entitled:

The evolution and current status of digital radiography ...

... and some speculations on the future of computed tomography.

For the first half hour of the talk, I ran through some basic x-ray and detector physics and then surveyed things like image intensifiers, CCDs optically coupled to scintillator screens, computed radiography and flat-panel detectors. Then I spent fifteen minutes describing the evolution of my thoughts on digital radiography for Nepali villages, some of the design considerations and the current configuration of the x-ray suitcase (GhamiCam). I showed the hand and breast-phantom images from the TUTH visit and then went to a false summit of a conclusion slide. It summarized what we had done on DR and answered in the unequivocal affirmative the question of whether low-cost DR in Nepali villages was feasible.

Then up popped the last bullet, with the question:

- Low-cost CT in Nepali villages???

I addressed this question by recounting our experience with FaCT, which I described as a not-so-low-cost CT. I then looked at possible cost savings in each of the components, starting obviously with GhamiCam as the detector. I claimed a huge savings could also be achieved by using a light-weight field-emission x-ray tube, with its low x-ray output compensated by the large-area detector which captures much more of the radiation on each exposure than a line detector would. Lots more ideas which I will expand on when I return to Tucson. Punchline: I think a very capable CT system can be built for \$30k in components. At the least, it will give me something to mull over during the trek, just as I worked on the design of GhamiCam as we trekked away from Ghami two years ago.

After the talk, a woman professor expressed great interest in forming a consortium with TUTH to make GhamiCam a reality. Her ideas seemed plausible, and I said we would be in touch by email. As soon as I left for lunch with a couple of other faculty members, however, I was warned not to work with this woman, because she was a Maoist. All sorts of tales ensued to support this position. When I inquired as to who else on the engineering faculty would be a good contact, I found there was very little interest in a collaboration with their own medical school, so it may be the Maoist or no one.

I'm not too worried if no one from engineering participates. The group in the radiology department at TUTH seems eager and capable of moving ahead. I will meet with them after the trek to make more definite plans.

In the afternoon we visited a gynecological clinic in a very poor section of Kathmandu. It specializes in early detection and prevention of cervical and breast cancer. Very depressing building, very daunting challenge.

We met our guide, Narendra, in the evening and discussed the trek details, many concerning the x-ray suitcase. It will be packed in a duffle bag, cushioned by our fleeces and carried by a separate porter.

We set off in less than four hours. No more reports for a while. Wish us luck.

We cross the pass on April 20.

Harry

Day Five
4-14-2009 (or 1-1-2066)

Today is the fifth day of working in Nepali clinics, and coincidentally the fifth day of our trek.

Four days of hard climbing have brought us to the village of Chame, headquarters of the Manang District. Chame is at an elevation of about 9,000 feet, and our starting elevation was 3,000 feet, but gaining those 6,000 feet required a total vertical ascent of almost 12,000 feet (per GPS). We are working hard but doing fine. No muscle soreness, no blisters, no serious intestinal problems. Two more days of hiking will put us at Manang, where we get an extra day for rest and acclimatization before starting the four-day assault on Thorung pass, at twice our current elevation.

By hiking a couple of hours past our scheduled stop the day before yesterday, we were able to arrive at Chame around 3:00 PM yesterday. After the mandatory afternoon tea, we climbed about 300 feet up a winding stone pathway to the District hospital. After explaining why I was there, I learned that the resident physician was out of town, and moreover that the next day (today) was the Nepali New Year (Happy 2066!). Nevertheless, the hospital administrator and a radiographer agreed to come in on the holiday and let me run my experiments.

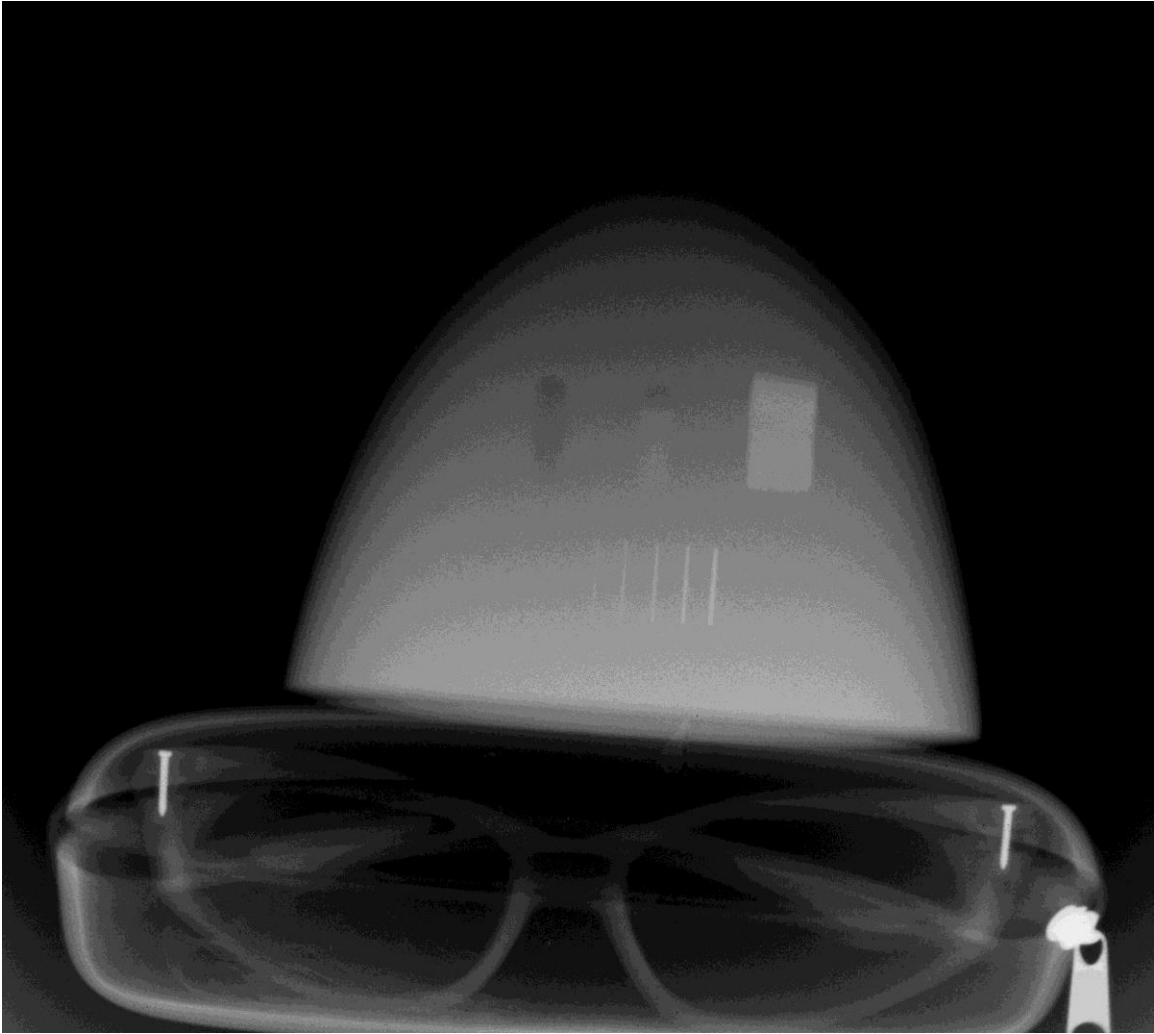
After breakfast this morning, our guide, Narendra, a porter carrying the x-ray suitcase, Cathy and I hiked back up to the hospital. The administrator gave us a short tour, ending at a very primitive x-ray room, where he said I could go ahead and run the experiments. One catch, though: he said he expected the power to go out in 15 minutes.

I was doing OK operating against the clock until it came time to drape the black cloth over the system. Then I was all thumbs. I have done that chore a dozen times by now, but this time I think I invented new ways of getting it wrong.

By the time I got the system set up, my allotted 15 minutes had passed, but fortunately the power was still on. I quickly ran three digital images of the breast phantom, all with the same kVp and mAs but different camera ISO. The ISO seems to matter a lot for two reasons: getting adequate sampling of the grey-level histogram and suppressing stray light. It is clear that the aluminum structures need to be anodized and the inside of the suitcase needs to be painted black.

Power still on, we ran two film radiographs at two different kVp – the control system allowed only 60, 70 and 80, so I chose the high and low. Then, while the second film was being developed (manually, of course), I did some dosimeter tests to measure the x-ray exposure.

Some quick Photoshop games showed that the digital images came out fine. Here is the one at ISO 400, the lowest I ran:



Notice that the patient has the rare mammospectacle syndrome.

Tomorrow we hit the trail again and will try to make contact with the Chame doctor, who is flying in to an airport near our trekking route.

Day Six **April 16, 2009**

Today is the sixth day of visiting clinics and the sixth day of actual trekking, not counting the rest day in Chame. The two numbering sequences will now rapidly diverge, however, because we start our four-day assault on Thorung Pass the day after tomorrow, and we have no further clinic visits planned for another week.

The trekking has gone splendidly. We are now at almost 12,000 feet, from a starting elevation of around 3,000 feet. The GPS-based vertical ascent is over 16,000 feet, so it is as if we had climbed out of the Grand Canyon three times in six days. Today's views of the Annapurna Range were really magnificent, and everyone tells us the best lie ahead. The latest report is that the snow on the pass is almost gone and that it is getting warm.

Today's visit was to the Himalayan Rescue Association Clinic in Manang. It is the sister clinic to the one in Pheriche, near Everest Base Camp, which played a prominent role in *Into Thin Air*. There were three doctors present for the discussion: Americans Neil Waldman and Lara Attard and Nepali Prativa Pandev. After I explained the system and showed some images, they were very excited and supportive. The clinic serves locals as well as injured trekkers and climbers, and all three docs had suggestions on how DR and teleradiology would help both groups. Two of them had to leave to see patients, so I will have to sort out the details by email. All promised to write letters of support when I approach foundations or other organizations for funding.

Speaking of *Into Thin Air*, Cathy and I met Todd Burleson, the hero of that tale, in Kathmandu before we left on the trek. Had about a half-hour chat with him and his fiancée.

I also want to recount an interesting conversation I had with an Israeli industrial engineer/MBA. On our second day on the trail, he fell into step with me, and we chatted for an hour or so, mostly while climbing steep inclines. As we compared itineraries, I mentioned that we would spend two days in Chame. He found that strange, so I explained that I would do some experiments at the Chame Hospital. That really intrigued him, so he probed further and I ended up telling him the whole story of the x-ray suitcase. He immediately wanted to know the cost, and I said it was \$4,000 for the components. "But what about the development costs? How big was your team," he asked. I said I had a team of five, but just for two weeks. I explained that the mechanical structures I had suggested were proving unworkable and that, with my departure for Nepal looming, a colleague (Lars Furenlid) gave the design problem to a group of five grad students, who worked together in an incredibly effective manner to produce the suitcase system resting on my porter's back. Of course, the names of the students would not have meant anything to my Israeli companion, but for the benefit of recipients of this report who might know them, the Fab Five are: Helen Fan, Heather Durko, Steve Moore, Jared Moore and Brian Miller. Steve is a BME student and the other four are in Op Sci. Without their incredible achievement, I would not be writing to you about DR in Nepal.

Day Seven
April 20, 2009

I will count April 20 as the seventh day of clinical contacts, though we were quite far from any clinic. Instead, we were climbing from Thorung base camp at 14,500 feet to Thorung high camp at 15,800 feet. The next day we cross the pass at 17,872.

Still, it was a day in which I collected a great deal of information about healthcare programs in Nepal. On the trail, I again met Dr. Prativa Pandey, whom I had first met at the Himalayan Rescue Association Clinic in Manang. Dr. Prativa (a common form of address in Nepal – I was Dr. Harry) runs the CIWEC Dental Clinic and the Travel Medicine Center in Kathmandu, and she was climbing over the pass to get back home after consulting in Manang. She received her medical education in India but did residencies and worked in the US. For example, she was at Beth Israel in Boston for eleven years.

Over lunch and dinner at High Camp (which was a lot less primitive than the name suggests), she told me about a project conducted by Yale University and a group called Nyaya Health in Acham District in Western Nepal to demonstrate the improvements in rural health that could be achieved with modern medical techniques. She said that this center would have ultrasound but no radiology. She thought it would be a good demonstration site for our DR system, and she thought it was essential to start with such a single-site demo. She wasn't quite clear where Acham District was, but she said there was a flight from Kathmandu to an airport that was a mere ten-hour Jeep ride to the clinic.

I told her about my plans to work with the Institute of Medicine and Tribhuvan University Teaching Hospital, but she pooh-poohed them. She said all of the docs at TUTH have the opportunity for lucrative employment after hours at private clinics like hers, and that they would have no interest in rural health. I will take this part of her advice with a grain of salt because Dr. Sunil Pradhan, chief of Radiology at TUTH, told me privately he is very excited about the possibility of making contributions to rural areas.

She also said that our system might find a niche as a low-cost, low-quality DR system for rural areas or governmental clinics that could not afford commercial DR systems like the Siemens unit she has. I assured her we had no intention of building an inferior system, but we really have to carry through on this promise. I need to check the abstract deadlines for RSNA to see if we can still get a paper in there, but SPIE will be our big chance to argue the comparative performances. High priority when I get back will be to do a series of innovative image-quality studies. For example, we might consider detection of a low-contrast sinusoidal transmittance pattern, which we would generate, of course, by rapid prototyping.

Dr. Prativa is also on the board of ANMF (American-Nepali Medical Foundation, I think), which promotes rural health in Nepal, and she said she would get me an invitation

to their annual meeting in June in Columbus, Ohio. I will plan to attend if the invitation materializes.

She was pretty negative about other foundations and NGOs, especially the American Himalayan Foundation, which she described as “controlling”. The one NGO she is favorable towards is the Nick Simons Institute, which I visited before the trek. I will try to make them an integral part of the project, especially for training the rural health workers in operating our system. A major effort on our side will be to simplify the controls – we can’t expect the operator to master the 500-page manual for the Nikon D700.

As for the trek, we did indeed cross the pass on April 21. We started before 4:00 AM, hiking with headlamps on narrow, icy trails. I was never so glad to see the morning light! We arrived at the pass around 8:00 in brilliant sunshine and howling winds. According to the optical thermometer that Heather lent me, it was 24° F, but the wind chill must have been below zero. Both my GPS unit and my small Olympus camera immediately succumbed to the cold, but we were able to get a couple of “summit” photos with the Nikon (below). Then we immediately started a long, grueling 5,200-foot descent, arriving at the Hindu holy site of Muktinath around 5:00 PM.



Day Eight
April 23, 2009

Today we visited the Mustang District Hospital in Jomsom. We had visited there two years ago, but a new doctor, Kapil Gautan, is now in residence. His English is poor and he seemed somewhat bewildered, not understanding who I was or why I wanted to use his x-ray room.

Nevertheless, he eventually gave us the use of the room and the services of a technician, and we (Cathy, two Nepali guides and I) began to unpack the suitcase and set it up. We quickly discovered that several screws had worked loose while jostling across the pass on the back of our porter and that the frame was misaligned, much as it had been after the tender mercies of a TSA agent at LAX. It took five minutes or so to fix the problem, prompting Dr. Kapil to comment on how difficult the system is to operate.

The rest of the setup went smoothly, and we shot both analog and digital images of the breast phantom. To my surprise, it was difficult to tell them apart. The film image, developed in the very dark room that prompted me to start the DR project in the first place, showed all the relevant detail and only a few development blotches. When I showed the images to Dr. Kapil, I had to explain that there were nevertheless advantages to the digital format, which allows image manipulation and ready access to the internet. Neither he nor I were convinced. Still, he was very excited about getting the new technology, and I promised to work hard to make it possible for him to have it.

As for the trek, we are now running about a day and a half behind schedule, more because of the x-ray project than our slow pace (the latter was built into the schedule). Given the winds and the condition of our legs, making up the deficit and getting back to Kathmandu in time for our flight to Tokyo did not seem feasible, so today we are truncating the trek by omitting three relatively unexciting days of hiking in a deep gorge. Instead, we will take what might be a very exciting jeep ride to our last stop, Tatopani, where we will loll in hot springs for a day.

Here is the final trek log, Harpers-index style:

80:	Miles trekked
40:	Miles trekked uphill
17,872	Highest elevation reached, in feet
30,000:	Vertical ascent, in feet
6:	Vertical ascent, in miles
15:	Average percent incline

- 15: Maximum percent incline on treadmills at our health club
- 4: Number of clinics at which x-ray images were taken
- 0: Number of clinics where digital radiology was available
- 0: Regrets about the trip
- 100: Percent of mission accomplished (including a part we haven't told you about!)

Day Nine
April 28, 2009

This morning I visited the Tribhuvan University Institute of Medicine (IOM) and its affiliate, the Tribhuvan University Teaching Hospital (TUTH). In the afternoon I visited a private facility, the CIWEC clinic.

I was a bit apprehensive about the morning visit for fear that the enthusiasm shown for our DR project might have waned in the three weeks since I was last at TUTH, and I had not been specifically on the main IOM campus. To the contrary, everyone at IOM and TUTH was still bubbling over with excitement about the project.

The lead person at TUTH is still Dr. Sunil Pradhan, Head of the Radiology Dept., but I quickly found that he had been putting together a local working group on the project. Key people on the working group are Shanta Lall Shrestha, Associate Professor of Medical Physics; Ganesh Bahadur Pokharel, Associate Professor and Coordinator of the BS and RT Programs; and Dr. Ram Ghimire, whom I had heard described as the best radiologist in Nepal. They expect to add expertise from the TU Institute of Engineering if needed, as well as assistance from people versed in QC and maintenance.

Dr. Sunil had also been very busy at a much higher level. He had pitched the project to Dr. Sharad Raj Onta, who is head of the Nepal Health Research Council, and Dr. S. Sakya, Joint Secretary of the Nepal Council of Science and Technology. Dr. Onta has agreed to specify our project as being in the “priority sector”, for whatever that is worth.

Another important organization which was approached by Dr. Sunil is the Nepal Academy of Science and Technology (NAST), which is led by Prof. H. N. Bhattarai. Members include my friend Prof. Jagan Nath Shrestha and the IOM Director of Research Professor Bharat Mani Pokhrel, with whom I had an extensive meeting this morning. Dr. Pokhrel pledged to do everything possible to move the project along, including helping to draft a Memorandum of Understanding (MOU) between UA and TU-IOM.

Dr. Sunil would like to set up a pilot project with our DR systems at three diverse sites in remote areas of Nepal, though perhaps not quite as remote as some that I visited on my treks. One requirement is that there be relatively easy vehicular (maybe Jeep or helicopter) access, and another is that there be internet access. He sees three aspects to the project: training of local personnel, clinical reading via teleradiology and research into relative efficacy. For the latter he suggested screening for tuberculosis as the task, so I have to do some reading on radiographic vs. sputum indicators of TB. Whenever the DR system is used, he suggests that the image be sent immediately to TUTH for initial reading and clinical response, then perhaps also sent to the U of A for a second reading. He suggests Picasa as the transmission method to U of A, but I want to make sure that our local radiologists can still manipulate the grey levels and other image characteristics.

Dr. Sunil and his staff have also been assembling information on less-expensive cameras for the system. Unfortunately, he had prices but not model numbers, so I can't check the

specs. For our part, we should do a careful comparison of the Nikon D700 and D90 as soon as possible.

The CIWEC visit was brief because my contact, Dr. Pravita Pandey, had a very full clinical load. I did succeed in getting an image of the breast phantom on an Agfa CR-30x system at the same exposures I have been using routinely: 60 kVp/20 mAs. Lots of detail, but the image noise is also quite visible. I should play with the display of our images to see if I can make a similar tradeoff.

To close the books on the trek, let me tell you a bit about the last three days of our travel, especially from Jomsom to Tatopani. This stretch runs through the Kali Gandaki Gorge, purportedly the deepest canyon in the world, and we had been a bit wistful about doing it in a jeep rather than trekking. As it turned out, however, it would have been a pretty miserable trek. The problem was that the trekking route was the same as the narrow jeep road for at least 90% of the way, and the jeep drivers – ours included – took it at high speed. Cathy pointed out that they slow down for animals and small children but that adults are on their own. The poor trekkers have to scramble up a hillside to get out of the way, and even if they succeed they disappear in a cloud of fine, irritating dust. It wasn't exactly a pleasant ride inside the jeep, but it was surely better than being outside it on the road. The only good thing to say is that we got to our destinations (Ghasa, Tatopani and Pokhara) rapidly and could enjoy the rest of the day in pleasant surroundings.