

*The Road
Less Traveled:
A Memoir*

Urs Kuhnlein

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THE ROAD NOT TAKEN

*Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;*

*Then took the other, as just as fair,
And having perhaps the better claim,
Because it was grassy and wanted wear;
Though as for that the passing there
Had worn them really about the same,*

*And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!
Yet knowing how way leads on to way,
I doubted if I should ever come back.*

*I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I,
I took the one less traveled by,
And that has made all the difference.*

Robert Frost (1874–1963).
Mountain Interval, 1920

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Cover photo: Climbing Lion’s Way in Bugaboo Provincial Park, Canada. Bugaboo Spire in the background. Urs introduced his son to the Bugaboo’s in 1996. It was one of many mountain trips they shared, taking Urs down memory lane, and lighting a passion for climbing in his son.

Photo by Peter Kuhnlein.

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My Childhood in Altstätten, Küsnacht, Samedan, and Schiers

That I am even here is a testament to luck. Sometime in the summer of 1940, Hedwig Kühnlein-Göhner jumped several times off a kitchen table, fearing the future and not wanting to bring her unborn child into a world of turmoil. While I peacefully slumbered in my mother's belly, the world around Switzerland was going to pieces. Germany had defeated France in July, and Italy had started an offensive in North Africa and the Balkans. Like his fellow countrymen, my father had been conscripted into the military; I was most likely conceived when he was home on leave from his service.

Already mother to Heinz, Klaus and Sybille, my mother was terrified that the German invasion and eventual conquering of France was a harbinger of things to come for Switzerland. Fortunately, her attempts didn't work, and I was born on 17 September 1940 in Zürich.

My first memories of our world were from Altstätten (St. Gallen) in eastern Switzerland. My father worked in the TUFA (short for *Türen und Fenster* or "door and window factory"). The owner, Ernst Göhner, brother of my mother, Hedwig, was very successful in steering the company through the war and was a father figure for all the employees who worked for him. His story was partly published in the biography *Somebody Has To Do It* by Alfred A. Häsler¹ (1981).

1 HÄSLER, A. A. *Einer muss es tun. Leben und Werk von Ernst Göhner*, 1981. Verlag Huber, Frauenfeld-Stuttgart.



The Kühnlein siblings, along with Berti and her sister, Lisbeth, in Altstätten (St. Gallen).
Photo ca. 1944. From left: Urs, Berti Bishop, Sibylle, Klaus, Lisbeth, Heinz.
Lisbeth was Urs' mother's domestic help beginning in 1952.

Altstätten, a beautiful little town nestled near the border of Austria near the Alpstein Mountains, was transitioning from a farmer's village to an industrial town. Our family lived in a single-family house outside the village area called the "Feld." A treasured member of our family was Berti Bishop, our *au pair*. Later, her sister, Lisbeth, succeeded her. My mother was very warm-hearted but, like everybody at the time, believed in corporal punishment. Berti had the task of executing such punishment. These bouts always ended in laughter, with Berti chasing us around the garden, swinging a carpet beater. Of course, she was careful never to catch us.

It was more serious with my father. My brother, Klaus, and I loved doing somersaults from the night table into our bed, which made the ceiling lamp in the downstairs living room sway a foot up and down with each jump. Unlike Berti, he caught us with the carpet beater, and the pain was more intense as we were only wearing pajamas. Some tears helped me settle back to sleep.

Our house "*im Feld*" lay far away from the village center and was surrounded by farms, some of which had fields distributed around the village,



My Mother and Father Kühnlein, ca. 1976:
Hedwig Kühnlein-Göhner and Viktor Kühnlein.

reflecting past generations' family history and inheritance. The farmers would drive their cows from their pastures back through town to their milking barns every evening. At milking time, we often went with our cups to visit our neighbors, who filled them right from the cow's udder. Warm and creamy, a delicious treat!

In the summer, we walked barefoot to the *Kindergarten* and elementary school. I vividly remember the feeling of stepping in a fresh, steaming cowpie, squeezing it together between my toes. When the cowpies dried, they were excellent frisbees to shoot at each other. We also collected horse "apples," which we sold to neighbors as rose fertilizer.

One special annual extravaganza was when the circus came to town. Everything was unloaded at the train station just outside of town, and then the circus paraded up the *Bahnhofstrasse* to the *Breite*, the biggest plaza of our village, where they erected a big tent. We eagerly followed the elephants to add to our fertilizer collection, and our carts were full in a single go.

My earliest friend in Altstätten was Jakob Hasler, a neighbor boy. We often went to the *Tobel*, a small community-forested ravine. There, I learned how to make a fire and roast potatoes, and even though I was not too fond of potatoes at home, the ones we roasted in the forest (without parental supervision, naturally) were absolutely delicious. We also tried to catch trout in the river. I recall corralling a trout with some rocks, catching it with my bare hands, and then throwing it onto dry land. But I threw too far, and it landed in another part of the creek, narrowly escaping its demise and swimming away to freedom. My secret relief at not having to kill it confirmed my early soft heart. I knew even then that I did not want to hurt animals.

Jakob and I also collected *Bärlauch* (Bear's garlic), a forest herb the Hasler family used in salads. Foraging like this made me feel like I could live "off the land" without the interference of humans.

On my vacations, my parents often sent me to summer camp in the *Buchserberg*, a place further upstream from Altstätten overlooking the Rhine valley. I loved that place, where we could play outside in the forest all day long. Uncle "Heiri" (Heinrich) ran the camp. I got some dried *Edelweiss* flowers from him, which I treasured for many decades until they withered. He also gave me the book *The Swiss Robinson* (I was in the 4th grade), the story of a family that shipwrecked on an Island, like Robinson Crusoe. It woke my appetite for reading, and, like our granddaughter Sophia today, I never went anywhere without a book in hand. At night, I often read under the covers in bed with a flashlight to get around parental curfew.

Besides vacations on the *Buchserberg*, my siblings and I often went for vacations to Zürich with *Muetti's* three sisters and *Vati's* parents. Among my aunts, Heinz was Aunt Emi's darling, while I spent most of the time with Aunt Luise.

I loved to be with Aunt Luise because she read to me every evening. I would turn on the reading lamp and patiently wait for her to sit with me. I vividly remember reading *Bambi*, a story told in two volumes about the life of a little deer; *Kloetzli*, a book describing the adventures of a puppet made from blocks of wood; *Pimpanpoenchen*, *Pumpernickel und Pipeling*, the story of three black boys. The latter is still with me after 75 years. The three boys were flying a kite when a wind blast suddenly carried them off until they

landed on the moon. There, the moon men treated them royally, specifically giving them rice pudding with raisins. Since this occurred shortly after the war, there was no rice in Switzerland, and the closest I could think of was *Maisbrei* (made from maize). I therefore wished to have corn mush with raisins as my birthday dinner. That lasted only once or twice, because my siblings, especially Heinz, complained about not having the opportunity to celebrate their birthdays with a good meal.

When I visited with Aunt Luise at the Froebel Strasse, she let me go alone to visit the Natural Science Museum and the Geological Museum at the University of Zürich. I spent many afternoons in the museum pondering over the marvelous creations of nature. It awoke my thirst to go out into the world and explore all those things.

Another person dear to me was Aunt Klaerli. Her mother, my great aunt Mina, lived a long time at the Hallenstrasse and helped my grandmother on the Göhner side raise the children, including my mother. Aunt Klaerli was also dear to Uncle Ernst Göhner. Her father, who had already passed away, had been a great nature lover and left Aunt Klaerli an extensive rock collection.

Seeing I was an avid collector of nature memorabilia, she gave it to me. Some of these rocks are still part of my collection, which has grown in the meantime. My love for the beauty of these minerals nearly made me want to study geology! Only my love for mathematics and the laws that determined the evolution of nature made me decide differently.

Of the teachers in Altstätten, I most admired my third- and fourth-grade teacher, Osterwalder, who got the nickname *Haesi*, meaning little rabbit, because his family name reminded us of the bunny that brought us our Easter eggs, real ones and also hares made from chocolate. I met Haesi first when Heinz was still a fifth grader, whereas Klaus, Sybille and I were still in the *Kindergarten*. Heinz made us follow him to the big school. He told us to wait outside until all the children were in class and then come and knock at the door. When Haesi opened the door and saw three grinning children, rather than send us away, he made us all sit down and gave us paper and pencil to make drawings.



The Kühnlein siblings, ca. 1990. *From left:* Urs, Klaus, Sibylle, and Heinz.

Later, in his biology class, each student had to plant a sunflower in the school yard and watch it grow throughout the season. He also took us on excursions to a nearby forest and made us admire all of the things in nature. I still remember how he showed us a plant and asked its name. He hinted that it was the same as the one of a girl in a fairy tale of the Brothers Grimm. For some reason, I blurted out “Rapunzel,” the hero of a tale Aunt Luise had read to me on a vacation with her. It was correct, and I was so proud.

In this story, a sorceress helped a woman conceive a child by providing her with the herb *Rapunzel* (lamb’s lettuce) from her garden. However, once the child was born, the woman had to give it up to the sorceress in return for the favor. The sorceress then shut the beautiful girl up in a tower. Whenever she visited the child, she called out: “Rapunzel, let down your hair.” The sorceress then climbed up the long braid of hair to visit her. One day, a prince happened to pass by the tower and heard this. He returned the next day and made the same call. He climbed up, fell in love with the girl, and the two were happy ever after.

This fairy tale has stayed with me since then. It combines nature with magic and love.

Haesi's favorite punishment was making students bring their own ruler up front and then stretch out their hand for a strike that often resulted in a broken ruler. I remember one time a classmate was held after class after being punished. All the schoolmates assembled outside, waiting for her to come out. I felt so bad for the girl that I snuck into the school where Haesi stored his bicycle and let out the air from both tires. So, I was a unique combination of part rascal and part soft-hearted little fellow. I guess being a rascal was mostly my trying to gain self-confidence.

Elementary School in Küsnacht and Meeting Hans Weiss

Our family moved to Küsnacht near Zürich when I was 12. I broke out in tears when I entered the new house. It was more modern than our previous home, but I missed my friends and the rural atmosphere of Altstätten.

Upon entering the 5th grade, I first established my rank in the class pecking order. I was a real rascal and did very badly in school. At the end of the first semester, our teacher assembled the class around his desk and held up my notebook. The first page was OK, the second page had a big ink spot – and every page after that was blank. The teacher came to my home and had a long talk with my parents. From then on, my parents locked me in every free afternoon. It was boring, but at some point, I became ambitious and made the most beautiful notebooks with many colored drawings. During the next semester, I had top grades in every subject.

* * *

What really changed my life was the friendship I formed with Hans Weiss. His father was a Professor of Ethnography at the University of Zürich, and his field of expertise was Switzerland. He taught Hans and me how to rappel at a cliff close to the trail up from the Küsnachter ravine. He also went with us to collect mushrooms and orchids, still further fostering my love of nature and the outdoors.



Klaus (left) and Urs in approximately 1961.



Urs, Hans and friend Yvonne, 1961.

My mother trusted Hans' family very much and let me go with him wherever he went. We took exciting trips by bicycle, and I still remember one time when I fell off my bicycle a day before a planned trip with Hans over several Swiss mountain passes. I had abrasions on my elbows and knees, and I spent a night in excruciating pain, but I did not say a single word to my mother because I was afraid she would not let me go on the trip with Hans the next day.

We also took several canoe trips down the Rhone from Geneva (Seyselle) through Lyon, Avignon and the Camargue to Saintes-Maries-de-la-Mer near the Mediterranean. I will never forget wading for hours through ankle-deep water toward a white wall of thousands of flamingos that then took off in a big white-orange cloud. I repeated this trip several times later in life, once with my brother Klaus and once with Koebi (Jakob), Hans' brother. Later in my life, other river trips in Europe were on the Loire, the Danube from Regensburg to Vienna (with Klaus and Heinz) and the Drau in Austria from Linz to the border with Yugoslavia (Dravograd) with Klaus.

Besides introducing me to bicycle tours, Hans also introduced me to mountain climbing. The first climb was the Galenstock in the Urner Alps. Klaus and Martin Sturzenegger also went along on this climb. Rather than taking the normal route via the Northridge, we went straight up the East face. I was roped together with Klaus and was terribly scared because of the exposure. When we returned to the hut, the guardian muttered, "Those who are with God are rewarded in heaven." When we recounted our adventures at home, my mother's comment was, "Next time, don't rope together with Klaus, so that at least one of you two comes back alive."

To overcome my fear of heights, I started practicing climbing on our house. I would go back and forth on the roof ridge and then "summit" the top of the chimney. After a while, my mother asked us to come down because the neighbors, fearful of suffering heart attacks, had called on the phone and complained to her.

One of the bigger mountaineering trips with Hans some years later was our unforgettable climb of the Bietschhorn in Canton Wallis. Here is a narration by Hans:

My first big mountain climb with Hans Weiss, Autumn 1961

Wednesday, 13 September.

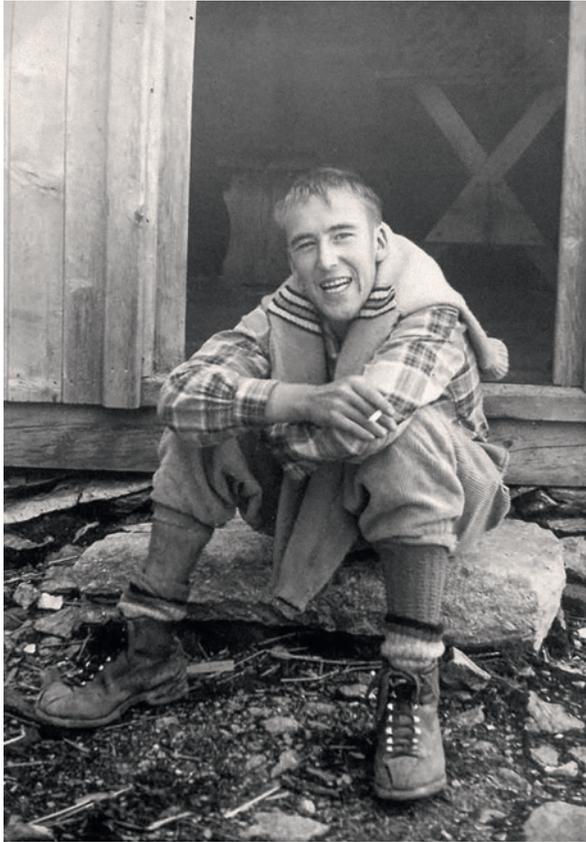
11.40 arrival in Goppenstein im Lötschental. Walk to Wiler on a hot and dusty road with an elderly, energetic English couple. Short inspection of the anthracite mines near Ferden. Ferden-Kippel-Wiler. In the mountain guide's shop, we buy a bottle of apple wine, which we empty on the other side of the Lonza River in the shadow of larch trees. Hot ascent - cold wind from the direction of the edge of the Nest glacier - blueberries - sheep - thirsty arrival in the wooden hut with closed shutters. We rested on the bench before the hut in the last rays of sun, drink tea, enjoy the solitude and the view. A silvery wall of fog surrounds the jagged West ridge of the Bietschhorn. The summit is not visible: a promise or a bad omen?

After dinner, we stumble to the top of the nearest stone hill and watch the vanishing glow of the day. The night wind keeps us awake.

Thursday, 14 September.

Start off at 3.45 am. Cloudy sky. After stumbling for 3 hours through loose rocks, we climb Sheep Mountain. We lie exhausted in the snow, panting, steaming, and full of resentment for everything around us. A view into the Pennine Alps: a last glow from the sunrise on the glaciers of the Mont Blanc. The Dom and the Weisshorn are submerged in fog. Black clouds drift in from the West. The Bietschhorn is quickly shrouded. Polar atmosphere, somber. Up to the first shoulder, the West ridge is just a pile of rubble. From there, we follow wherever possible the ridge until the summit. Airy but solid towers guide us in long succession higher and higher. You soon forget the first towers because they become somewhat repetitive. The valleys sink gradually deeper and deeper.

Contrary to expectations, it gets brighter and brighter. We are sitting on a rock plate being warmed by the sun. What a delicious feeling after so much grey rock, cold wind and sky. Our mood changes, and from now on, we move on in completely different rhythms: in a crescendo until we reach the summit. The dominant Red Tower is still at the same distance as hours before. Without really wanting to, we increase our tempo, which makes us forget all our efforts. It feels like we are flying. You feel like there is a spring inside you, propelling you along



Urs sitting in front of the hut near an old molybdenum mine, 1961.

over the pointy plates and cracks. A roaring storm starts and gets stronger and stronger as we get higher; it finally overpowers everything like a powerful symphony. We can communicate only using sign language, and the storm fires us on to climb even faster. We traverse the Red Tower in no time. Then comes a ridge as sharp as a knife. We stop for a few seconds. Deep below us lie the roofs of Kippel, and to the other side, we can see Visp in the haze, 12,000 feet below us. Shortly before noon, we reach the presummit, and after half an hour of rest, we reach the real summit with the wooden cross.

At this point, Hans untied himself and made a side trip alone. I was terribly scared that he would fall, leaving me stranded on the summit forever.

Here is Hans' account of his solo excursion:

I climbed alone to the most southerly point of the crest, at about the same elevation as the summit with the wooden cross. Shortly before this point, I had to crawl under a small snow cornice overhanging to the west. I contemplated the view. One feels higher than the Pennine summits. Above the Monte Moro region, the view stretches in one big flight down toward the Mediterranean Alps. In between lies the plane of the Po River, enveloped in a grey sea of dust. The Aletschhorn and the Ebnefluh are again hidden in the fog. Only the mountain tops of the Tessin and the Adula groups shine under the clear sky. The bright sun is somewhere in the heavenly distance, shrouded by the fog, though I cannot see it, nor can I guess its position. The Rhone River shimmers like a band of copper through the dust before being lost somewhere in Lake Geneva. Before my toes, the crest breaks into a yawning depth like I've never seen before. The towers and needles of the southern wall of the Bietschhorn appear overhanging, and one cannot understand how they do not tilt and break. On the southeast ridge, a giant tower vertically below me resembles a swaying giant mushroom. The rivers in the depths of the Bietsch and Baltschiederthal are silent. Their rushing does not penetrate to those heights.

Quickly, I rejoin Urs on the main summit. We enjoy a smoke (a cigarette never tasted so good), and then we finally start our descent, which is still undecided. Down the West ridge again? When we reach the junction of the West and the North ridge, I am suddenly unsure. The North ridge that descends in a fine snow line into the depth invokes that first-time antipathy and fear. Still, after resting on the summit, I am suddenly tempted to follow it. Urs agrees. We also hope to progress faster by avoiding overclimbing the endless array of teeth while descending. We do not discuss it further and follow the snow ridge, which leads in a bold arc into the depth and then onto a shoulder, contrasting the green pastures of the Lötschental.

The summit has disappeared in black clouds. The wind howls. I see snow clouds stir up and chase over the east face with every forward step of Urs. The weather does not calm down the whole day. A new thunderstorm approaches from the West, at approximately the same level we are at. The last sunbeams fall over the hazy Rhone Valley. We are making good progress, but this ridge is also long. Finding a safe place to sit down, securing the rope and waiting until



Bietschhorn Mountain, Canton Wallis, Switzerland, elevation 12,907 ft.
Urs and Hans climbed up the center ridge and descended the left ridge, 1961.

the other has reached the end of the rope becomes a mechanical game. We have to climb over easy rock teeth three times until we finally reach the fork, where the North shoulder splits into the East and West ridges. The descent is easy but requires caution and concentration because of the numerous loose rocks. In a place protected from the wind, we eat a chocolate bar. We resume our climb rather quickly because the Nest glacier is still 100 m below us.

Contrary to our expectations, we have difficulties with the last icy slope. We progress only slowly. Urs slips and pulls me from my stand, but I can stop him several meters below. With a light fright in our bones, we cross a field of rocks, shale and completely collapsed snow bridges in the zone of the bergschrund (crevasse). Finally, on a plateau that surrounds the NW wall of the Bietschhorn like a curved balustrade, we are outside the zone where we have to permanently concentrate. Now, we can comfortably aim for home.

On Sheep Mountain, we get caught by a downpour. A veil of rain hides the landscape. Descending the snow slopes was a salvation after the ice and rock

blocks. It is so easy to lose the altitude, which had given us so much trouble earlier that morning. Half an hour after leaving the Sheep Mountain, I am standing in front of the hut, 300 feet lower, without being drenched, even with dry feet. A little while later, Urs follows. While the rain continues to drum on the roof, we prepare a princely evening meal with rice, mushrooms and coffee. That night we slept like a rock.

High School in Küsnacht, Samedan and Schiers

My middle-school years proved no less challenging. One of my teachers was a very pedantic man. I hated him. At this time, I was very excited about science and wanted to go to the Gymnasium and study at the university. He completely discouraged me and said that I was utterly crazy to even try. I still remember him pointing his finger to his head, the sign for somebody being “out of their mind.” To everybody’s surprise, however, I passed the entrance exam to the *Oberrealschule* in the city of Zürich (equivalent to high school in the USA, but harder).

The first year at the *Oberrealschule* in Zürich did not go very well. I was too shy to ask questions and failed to get help with my schoolwork. Every day, I had to commute by train from Küsnacht to Zürich. I had few friends. My grades were poor, and I was supposed to repeat the class. I think that, with some help, I might have passed. But my mother did not know mathematics, and my father was too busy working.

My parents sent me to counseling at an institution in the Canton of Zürich. After several days of testing, they deemed me smart enough for an academic career. My parents decided that, rather than repeating the school year at the *Oberrealschule* in Zürich, I should go for a year to the *Evangelische Mittelschule* in Samedan and then return to the next class in the *Oberrealschule* in Zürich. That decision changed my life. I think my parents got this suggestion from Hans Weiss’ father, once a teacher in the upper classes of the *Evangelische Mittelschule* in Schiers before becoming a Professor of Swiss Ethnography at the University of Zürich.

Samedan is a little village in the beautiful valley of the Upper Engadin located near St. Moritz. It harbored a boarding school that taught the lower grades of the Gymnasium. The classes were small, about 15 students. We were all friends, and the contact with the teachers was very close. I immediately rose to the top of the class and regained my confidence. After the first year, I begged my parents to let me finish my “maturity” education (the degree in Switzerland that allows you to enter an undergraduate program in any university in Switzerland). My parents agreed, and I shall be forever grateful for that.

I shared a room with a fellow from Zürich. We had a marvelous view of the Piz Bernina and Piz Palü. I loved the independence. Although the staff strictly supervised us, it was nothing compared to the parental supervision I had experienced at home. Rebellious against teachers also allowed me to gain prestige with my fellow students.

I spent nearly every free afternoon strolling in the mountains, searching for and observing animals and plants, mostly alone because none of my fellow students had my longing for nature.

After 2 splendid years in Samedan, I had to move to a boarding school in Schiers located in the Prättigau for the last 3 years of the Gymnasium. Schiers is a beautiful mountain valley located to the East of the Grisons (bordering Austria), leading up to the famous winter resort of Davos. Like Samedan, this school offered a beautiful combination of living virtually independently, having small classes and (with a few exceptions) experiencing good teachers.

Above Schiers, the alpine meadows stretched up to the Rätikon with the beautiful Schesaplana. It was ideal for a “mountain goat” like me. The first Sunday in Schiers, I talked a fellow student into coming with me for a hike to the nearby mountain village of Schuders. We decided to come back along the Schraubachtobel (a gorge), where my companion, Brändli, fell off a cliff and broke his leg. It was already getting dark. I returned to Schiers alone down the gorge (there was no beaten path then) to get help. I arrived at the school at 6:00 pm and returned with a rescue crew at around midnight. Brändli went to the hospital in Schiers. My first adventure at my new school! Brändli’s parents gave me an award of 50 francs for rescuing their son despite my being responsible for this ill-fated enterprise. However, they decided to take



Urs viewing the upper valley in Engadin, Switzerland.

him out of the school. This served as an incentive to make many more excursions into the wild Schraubach gorge, usually alone if I could not find somebody to come along.

In my last year, I became the president of our class. While I did learn leadership, my skills perhaps were not always put to best use. Once I encouraged the entire class to come late after a teacher had punished a student for being tardy. So, the soft-hearted young boy seeking justice was alive and well in the teenage Urs.

Two teachers in high school greatly influenced my career: my mathematics teacher, Bärenwinkel, and my chemistry teacher, whom we called "Topf." Bärenwinkel explained mathematical concepts so clearly that it was a pleasure to solve mathematical problems, and I was always looking forward to tests where I could solve intricate math questions.

"Topf," the chemistry teacher, taught us to have fun conducting experiments, which always made science classes fun. When he conducted chemical reactions, all the students sought safety and refuge under their desks. He also thought that the first step in chemical analysis was to taste. I will never forget the taste of lactic acid! One student actually painted phosphorous on his hand so we could see it glow in the dark. He ended up in the hospital with chemical burns. One time, Topf had a piece of sodium crystal jump onto his hairless head from a water bucket where he had put it!

University Studies in Zürich, Geneva, and Palo Alto

Undergraduate Physics and Mathematics at the ETH in Zürich

My love for mathematics inspired me to enter the *Eidgenössische Technische Hochschule* (ETH) in Zürich to obtain a diploma (equivalent to a Master of Science degree). Among the famous people who had taught at the ETH were future Nobel Prize winners Einstein (Physics, 1921), Pauli (Physics, 1945) and Schroedinger (Physics, 1933). At the time, Dr. Specker, the father-in-law of my niece, Isabel, was Professor of Mathematics.

I moved back in with my parents in Küsnacht. After the wild times away from home, living again under close supervision was hard. At first, I did quite well in my studies, though I did not exactly excel, mainly because I was spending too much time with the other gender rather than studying.

Various teachers tested us in groups of four to obtain a diploma (i.e., M.Sc.), and we had to solve problems at the blackboard. This stressful period lasted several weeks. In addition, the professors would assign students a project to work on in the lab. In my case, I was to build the model of a bismuth-antimony crystal using x-ray data, coloured wooden balls and building sticks. The coordinates of the atoms had been published, but my task was to build the model for teaching purposes. In 1965, I passed my diploma exams, albeit not with very high marks.

Graduate Studies at the Institute of Biophysics, University of Geneva (1965–1970)

Having earned my Master's degree, I now had to decide what to do next. I knew that one of my fellow students, Ulrich Lämmli, had gone to the University of Geneva to get a Ph.D. in biophysics. Since I was still very much

in love with nature, I decided to try this relatively new field, which combined physics and biology. I applied, was invited to visit, and was accepted as a graduate student. A stipend from the Swiss government covered my tuition and living expenses in Geneva.



Professor Werner Arber, 1978.

At the time, professors in the Institute of Biophysics (later named *Institut de Biologie Moléculaire*) who accepted students had to prepare projects suitable as Ph.D. projects. From the list of projects, I liked Dr. Werner Arber's work the best since it was well-defined and seemed doable. It was so straightforward. I fell in love with this way of doing science: posing a question and then trying to figure out how to answer it with the necessary experiments. The hardest thing in science is always deciding what you want to do, that is, having an idea and seeing it through rather than just dabbling around.

The topic was “host-controlled modification and restriction” and would determine my future and ultimately lead Arber to being awarded the Nobel prize. His work represented the beginning of genetic engineering.

Although small, the Institute of Biophysics in Geneva was well-known. Numerous postdoctoral fellows from the United States and visiting professors (including several Nobel laureates) all wanted to work in Switzerland. They were smart, clever and imaginative people. Many were bachelors, and we often had dinner together as a group in a nearby restaurant called the “Radio.” None of us had a social life, and because we were all working on our individual projects, there wasn't any real competition. So, we became friends and just enjoyed talking science, talking science, talking science ... One of the most inspiring professors who often came with us to the Radio

was Dick Epstein, one of the pioneers in the study of bacteriophage T4 whom everyone admired.

During this time, I also guided several ski and climbing parties, taking many postdocs and visiting professors to the mountains. Among the trips were two climbs of the Bietschhorn and a ski trip up Mt. Blanc (the highest mountain in Europe). Skiing around Geneva was great, with Chamonix and the Jura nearby. On a climb to the top of Rheinwaldhorn, I got to know my future wife, Harriet.

My Ph.D. Project in Geneva: Host-Controlled Modification and Restriction

The Ph. D. project proposed by Dr. Arber focused on “host-controlled modification and restriction” and dealt with a phenomenon of the bacterial world. Arber was a solitary worker and basically told me, “This is your project.” He would disappear into his lab, and I was left by myself to work. We used to joke that he’d come in early in the morning, then climb out his window, only to climb back in at the end of the day, having pretended he’d been in his office the whole time. Maybe he didn’t do all the research, but he knew what questions to ask. And questions always lead to more questions.

Some bacterial strains can defend themselves against viruses by cleaving the invading viral DNA. The host exonucleases then further degrade the resulting fragments. This was thought to be mediated by enzymes that cleave the incoming foreign DNA. The hypothesis was that these restriction enzymes can recognize and cleave DNA at or near specific nucleotide sequences. If this were true, it should be possible to isolate viral mutants that had lost such recognition sequences and were no longer susceptible to restriction.

“Modification” refers to an enzymatic activity that recognizes and modifies the same viral sequences and protects them against cleavage by the restriction enzyme. Bacterial strains expressing a restriction enzyme must also have a modification enzyme to protect its DNA from self-degradation.

Coming up with relevant questions is the most important aspect of science. Professor Arber suggested that, by working with a virus of small genome size, one should be able to isolate mutants that had lost such sites and were no longer susceptible to restriction and modification. An ideal candidate was phage ϕ d, a small virus 6408 nucleotides in length. He suggested my mutagenizing the virus and testing single isolates for susceptibility to restriction.

That was a very cumbersome procedure, and after testing 100 individual clones, I started to worry that I could do this for a year without success. But then, I profited from the knowledge of postdoctoral fellows in the lab. Dr. U. Winkler suggested I consider a selection method rather than isolating single clones. It took me just a few hours to develop such a method. I propagated the virus first by restricting bacteria to select for the desired mutants. Then I had to propagate the viral progeny in a bacterial strain that did not carry a host-controlled modification to have nonmodified viral progeny. This cycle should select viral mutants no longer subject to restriction.

Indeed, after only a week I had isolated my mutants and quickly completed my Ph.D. project. Thank you, Dr. Winkler, wherever you are! I was so excited because I knew I had it - I had found the mutants that were intermediately restricted and the double mutants that were inert to restriction (i.e., the plating efficiency of the restricting host *E. coli* B was 7×10^{-4} , 3×10^{-2} , and 1.0). This indicated that the wild-type virus had two restriction sites: The first mutant had lost one of these sites, and the double mutant had lost both sites.

This taught me that you can't just do something without thinking it through. You have to think about it first. After this happened, I got so excited I started to live in the lab. I would work there sometimes overnight, 24 hours, and I remember once playing chess with a friend after a sleepless night. I still beat him because I was so "alive." His name was Mitsuhiro Yanagida, became a professor at Kyoto University and later received many awards.

Ulrich Lämmli, who had also come from the ETH and had inspired me to come to Geneva, was our champion in table soccer. I trained hard with Yanagida until we could beat him, when it was two against one. One of Lämmli's technical papers became very famous and was cited 298,052 times in the scientific literature, as currently noted (2023) in Google Scholar.²

Simultaneously, the biochemist Stuart Linn arrived at Arber's lab. He had carried out his Ph.D. research at Stanford University in California in the laboratory of Robert Lehman. Werner suggested that he isolate mutant bacteria with a novel modification/restriction system that could recognize new DNA sequences. However, after a few attempts, he gave up and decided to try to purify the restriction enzyme type B. I found this process more exciting than pure genetics and suggested that I could go after the matching modification enzyme if he looked for the restriction enzyme. This entailed incubating isolated viral DNA and purifying an enzyme that could render the viral DNA resistant to restriction when transfecting the bacterial host. It was quite a complex assay, but I successfully identified such an activity.

Jack Steinberger, a skiing friend, was a nuclear physicist who worked at CERN (European Organization for Nuclear Research) in Geneva, the world-renowned nuclear physics research station. He submitted my first paper to the *Proceedings of the National Academy of Science*, one of the most prestigious American science journals. The paper also included Arber, who had guided our ideas and financed the project, and Linn as coauthors. Stuart Linn taught me all the tricks of molecular biology. Steinberger would eventually win the Nobel Prize in Physics (1988).

KUHNLEIN, U., S. LINN, and W. ARBER. *Host specificity of DNA produced by Escherichia coli*. 11. *in vitro* modification of phage *fd* replicative form. *Proceedings of the National Academy of Sciences of the United States of America*, 1969. 63(2): p. 556-562.

Shortly thereafter, we demonstrated that the previous suspicion - that modification was methylation of certain adenines in the DNA - was correct. However, it later turned out that the restriction enzyme does not cut DNA at the site where it binds to DNA. Rather, it migrates along the DNA before cleaving it at some distance from the recognition site. The phenomena of restriction-modification stimulated the search for other restriction systems in other organisms. That led to the discovery of several hundred enzymes that cleave DNA at specific sites, as was originally thought for the enzyme we studied. Now we knew that DNA could be cut, and that the resulting

2 LÄMMLI, U. *Cleavage of structural proteins during the assembly of the head of bacteriophage T4*. *Nature* 227, 680-685 (1970).

fragments could be spliced with other DNA fragments. This groundwork opened the gate to genetic engineering and has since been used to cure certain genetic disorders. Several years later (1978), Werner Arber and two more researchers, Daniel Nathans and Hamilton Smith, were awarded the Nobel Prize in Medicine.

I remember giving my defense seminar in 1970 in Geneva, knowing that James Watson (of Watson and Crick) was in the audience. In fact, there were always many Nobel prize winners in the audience of presentations from our Institute. Watson and Crick had received the Nobel Prize in Physiology or Medicine in 1962.

Stanford Medical School (1970–1972)

After being awarded a “Certificat de Spécialisation en Biologie Moleculaire” followed by a “Diplôme de Docteur ès Sciences Biologiques” from the University of Geneva in 1970, I was awarded a postdoctoral stipend from the Jane Coffin Childs Memorial Fund to be used in the Department of Biochemistry at Stanford University in California with Professor Dale Kaiser. I became successful because Dr. Arber became famous, and because of where I had received my Ph.D. I never had a problem getting a job.

Stanford is quite an illustrious place. I remember being very intimidated when I had to give a seminar with two Nobel Prize winners, Joshua Lederberg (1958 in Physiology or Medicine) and Arthur Kornberg (2006 in Chemistry), in attendance. Two more, the Department Head, Paul Berg (1980 in Chemistry), and fellow student, Andy Schekman (2013 in Physiology or Medicine), were awarded Nobel Prizes a few years later.

Besides finishing articles from my Ph.D. work on host-controlled modification and restriction, I collaborated with my fellow postdoc, Costas Georgopoulos, in isolating and studying bacterial mutants that interfered with the virus phage lambda development. His studies later led to the discovery of a series of proteins involved in the assembly and maintenance of multiprotein structures.

Costas was also an avid basketball player who often enticed me to come out and shoot some baskets on the outside court at the Stanford lab. Lou Reichardt, a graduate student in our department, sometimes joined us. He became famous for his climbs in the Himalayas. Specifically, he made the first US ascent of K2 with Jim Wickwire. He was big and strong, and once, when I fouled him on the basketball court, he chased after me. I really thought he was going to beat me up. Fortunately, he calmed down before he could get to me.

I loved California and the entire west coast of America. It was paradise for a nature lover like me. The forests of giant Redwood trees, the mountains of the Sierra Nevada, the desert, the Rocky Mountains, the Grand Canyon! Frequent climbing partners were Bill Dimpfl, Eric Terzaghi, and Will Spiegelman. There were unforgettable trips with Will to the Southeast Buttress of Cathedral Peak and the East Face of Mt. Whitney, both prominent peaks in the Sierra Nevada. And I'll never forget climbing my first summit higher than 5000 m, Popocatepetl, in Mexico with Bill.

Eric Terzaghi played a pivotal role in my future. I often visited him and his family in Santa Cruz, where he was Professor of Biochemistry at the University of California. In 1971, I drove up to British Columbia to join him for a climb in the Canadian Rockies. I still remember the night I was sleeping curled up in a sleeping bag when I was awakened by a warm breath sniffing my sleeping bag in the early morning hours. A bear!! I was so tired, I just mumbled, "Bear, go away!" and turned to the other side. Later in the morning, when I visited the bathroom, I heard some shuffling outside and thought the bear had returned. Faster than lightning, I climbed up to the rafters. A man came in, and I sheepishly mumbled from above, "I thought you were a bear." He thought that very strange.

Together with Eric's son, Scott, who became a well-known cello player, Eric and I climbed a mountain in the Canadian Rockies called "Snowpatch Spire." It was a very exposed climb with a long rappel at the end. At the time, it was my biggest climb. My son, Peter, later climbed it with one of his friends (see p. 83).

Harriet



Harriet Kling McCune, ca. 1970.

The most important event in my life was my falling in love with Harriet. I had met her as a graduate student in Geneva. She was spending a summer there in the laboratory of Eduard Kellenberger, head of the *Institut de Biologie Moléculaire*. At the time, all the microbiologists in the world knew each other because we were such a small group. Harriet had been on leave from George Streisinger's laboratory at the University of Oregon in Eugene. Both of these researchers (Kellenberger and Streisinger) were working on phage T4, an exciting model system to study the assembly of complex structures. George had just started a new project, the biology of the zebrafish. It has since become a significant model for the development of vertebrate animals.

Harriet came into our lab one day to ask a question. I clearly remember her wearing olive green tights and a mini skirt, and everybody was google-eyed.

She was the novel American among the conservative group of grad students. She didn't hang out with us in the evenings because she wasn't a "pub person," and she didn't enjoy our smoking. Also, she worked during the daytime, and we were night owls.

As noted earlier, in the summer of 1971, Eric Terzaghi had invited me to join him and his family for a trip to the Canadian Rockies. On the way north from Stanford, I decided to visit Harriet, who was back from Geneva and working once again in George Streisinger's laboratory.

When I returned to Stanford at Christmas, I received a surprise call from Harriet. She wondered what I was doing over Christmas and whether I felt like taking a ski vacation. I was delighted, and we spent a marvelous week in Alta, Utah, near Salt Lake City.

* * *

Well, we fell in love! Rather than working in the laboratory, I now spent most of my time driving back and forth between Stanford and Eugene. I finally packed up and transferred my stipend with the Coffin Childs Memorial fund to the Institute of Molecular Biology at the University of Oregon.

We married in the summer of 1972. It was a "hippy" marriage in the Cascade Mountains southwest of Eugene with two dozen friends from the university. We hiked to Vivian Lake at the foot of Diamond Peak in the Cascade wilderness area. We camped, went skinny dipping, and then prepared a marvelous wedding meal cooked over a campfire. Dinner consisted of chicken, roasted on ski poles, with rice, green salad, watermelon, and pound cake as dessert. A snow drift cooled the champagne and wine. The next day, we went hiking in the mountains surrounding us.

Harriet had two children, Matthew and Letitia, from a previous marriage. So, I married not just a wife but an entire family. They were the foundation of a happy life thereafter. I thoroughly enjoyed the new role of being a father figure. Matthew and I built a tree fort, and it felt so good when he accepted me as a companion when snuggling with "mom" early in the morning. I even helped them succumb to US marketing by taking the kids for treats outside the realm of their nutrition-conscious mom: McDonald's hamburgers for



Harriet and Urs preparing for the 4-mile uphill hike, 1972. Lynn and Jeff, seated.



Wedding guests carried their own gear. *From left:* Karen and Rebecca Shannon, Graham, Lori, and Carolyn Sheldon, 1972.



Heading to the ceremony. *From left: Letitia, Matt, Harriet, and Urs, 1972.*



Listening to congratulations. *Matt, Urs, Harriet, Letitia, 1972.*



Urs on top of Diamond Peak
after the wedding ceremony, 1972.

Matthew and Manwich spaghetti sauce for Letitia. I stepped in as the hero, delivering this delicacy to Letitia's plate (though we agreed it was not very good after all). I also took pride in teaching the kids some of my Swiss heritage, such as the importance of always having chocolate available during outdoor activities.

* * *

The first big travel adventure together was our honeymoon trip (the kids stayed with their father). We traveled from Vancouver across Canada and down to Pennsylvania, where I got to meet Harriet's relatives. Then we flew to Switzerland, where Harriet got to know my parents and siblings.



Driving East through the Swiss and Austrian Alps, 1972.



The Dalmatian coast South through Yugoslavia, 1972.

We bought a Volkswagen bus, constructed a sleeping platform, and traveled for 3 months through Austria–Yugoslavia–Macedonia–Greece–Turkey–Iran–Iraq–Jordan–Syria and then back to Switzerland. One temptation of traveling through the Middle East came from the stories of *One Thousand and One Nights*, which I had avidly read as a teenager. These Middle Eastern folk tales had been compiled in Arabic in the Golden Age of Islam. It was a marvelous journey through very diverse countryside. The high points of this trip were the mountains, the desert, and the coastal regions. What stays foremost in my memory are the monuments that reflected the history of the civilization of the Ottoman and Persian empires.

In Croatia, we traveled along the Dalmatian Coast and visited the palace of Diocletian, a Roman emperor, in Split. He died there about the year 312 AD. In Macedonia, we visited Pella, the birthplace of Alexander the Great, who conquered the mighty Persian Empire. Then, we traveled through Turkey, a remnant of the once mighty Ottoman empire. There, we visited Istanbul (Constantinople) and Ankara, touched the coast of the Black Sea, and traveled inland to Erzurum and then via Tabriz and Ardebil to the coast of the Caspian Sea. In Pahlavi (Bandar-e-Anzali), Harriet was delighted to savor the famous Caspian Sea caviar.



Enjoying the sights of Istanbul, Turkey, 1972.



Crossing the border from Turkey into Iran in sight of
Mt. Ararat and Little Ararat, 1972.

The next destination was Tehran, Iran, where we enquired unsuccessfully about traveling by boat from southern Iran to East Africa. I must admit, we were already somewhat exhausted from our travels and ready to go home. We got a visa for Iraq, the plan being to return to Switzerland via Iraq, Jordan, Syria, Turkey, and Bulgaria.

After sightseeing in Tehran, we started South and headed toward Isfahan. We thoroughly enjoyed Isfahan and its beautiful mosques. However, the Zagros Mountains in the West of the town successfully enticed us away from the busy and noisy towns. We took off on the nearest road out of town that led toward the mountains.

* * *



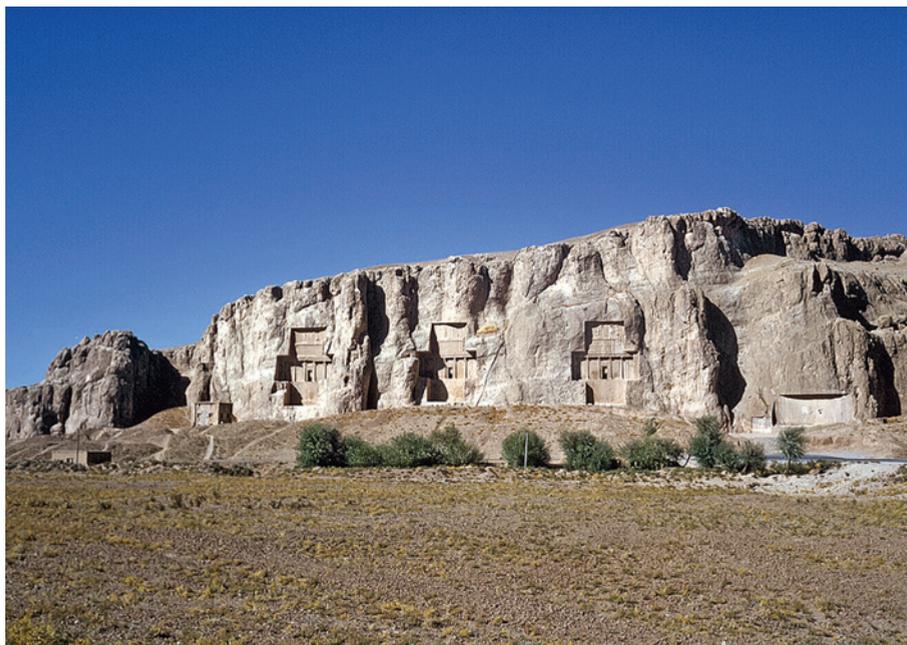
One of the beautiful mosques in Isfahan, Iran, 1972.

The following is an excerpt from Harriet's diary describing our trip to the Zagros Mountains near Isfahan:

We drove through the desert, and it was really beautiful – further and further south. Finally, we pulled off onto an old road and spent the night in the desert. Marvelous stars and moonlight. A jeep of strange people pulled up for a few minutes, but no problems.

The next day, we drove into Isfahan and parked. Some crazy made-up lady backed her Mercedes into the left front corner of our car – then denied it – and finally drove off. I gave her number to the police, but nothing was to be done.

We had had it! We wanted to go to the mountains, so we went to the tourist office and got some directions, but nothing specific. So we just drove off the valley floor and over a pass on a dirt road. We reached the amazingly large town of Shar-e-kord and drove on through. Finally, after passing several villages and driving on and on and seeing the high snow mountains to our left, we pulled off the road and slept.



The impressive ancient ruins in Persepolis and the tombs of the rulers Darius, Xerxes, and Artaxerxes, 1972.

The next day, we drove on until the street ended in a construction road camp. The workers agreed that we could leave the car with them, but they thought we were absolutely nuts to want to go to the high mountains on foot. They danced around, shivered, and rolled their eyes, showing that we might pass out from the altitude. They laughed at our sleeping bags in stuff sacks – how could that little thing possibly keep us warm in all that cold? They were interested in all our equipment, especially the ice axes and the crampons.

On we went on foot – very buoyantly across the desert toward the mountains. Some were difficult walking around countless thistles and over boulders. The only people we saw were a shepherd and three girls, who ran after us for a while, then turned back, frightened of Urs, to their picturesque stone village across the valley on the hillside.

We went up and up. It was so beautiful, and we were so happy we had decided to make this trip. The earth (clay) had a certain cracked look – what a mess it would be if it rained!!

We stopped to camp on the last hill before the mountains, but then decided to go on closer to the base of the mountain. We found a level place and made camp, had dinner, and went to sleep exhausted. A marvelous moonlit night – a dreamy sort of soft daylight – the mountains looked so majestic. A few altitude symptoms for me in the night.

Up early and breakfast – cream of wheat with raisins and peppermint tea. Even with no packs, the going was hard and I got out of breath easily. Later on, we saw some bear tracks.

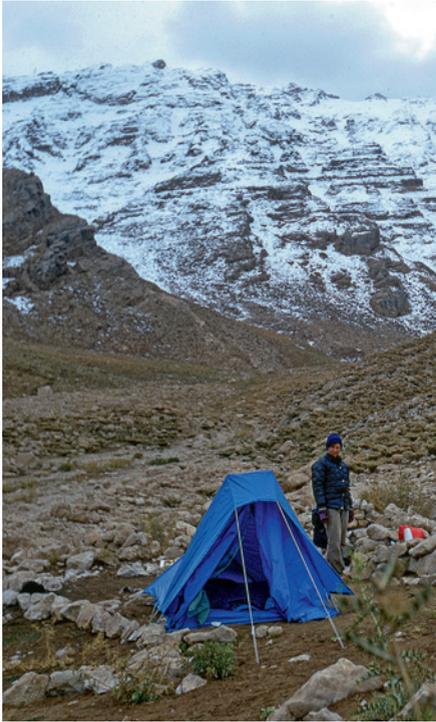
We split up after we had reached the end of the valley – and Urs went on to a further peak. I waited and rested – then decided to go straight up and look over the other side. It turned out to be quite hard. The snow was very soft in some places, and I went in over my knees. In other places, it was a little crusty and very steep – scary.

Urs reached his peak before I reached the ridge – then he came over to meet me. We peered into distant valleys that seemed to have no roads. We were very high – about 13,000 feet. It was cold, and the clouds were rolling in. We went back to our tent and had dinner, then went to sleep.

At 11 p.m., we heard the first patters on the tent. It was hard snow – like small hail. And it didn't stop. In the morning, about 4 inches of snow was on



Hiking with camping gear in the Zagros Mountains, 1972.



Before and after an unexpected snowfall in the Zagros mountain camp, 1972.

the ground. Oh ... it was so hard to get out of the warm sleeping bags! When we got out of our tent, there were bear tracks circling it. Luckily for us, the bear was not curious enough to explore further.

We broke camp at about 8 am and started down the valley a different way. What a beautiful place – covered with snow – a fantastic gorge – narrow in places and spectacular. On down the valley. Feeling lost in time. Mucky mud on our shoes made it hard to walk. We finally reached the river and knew that, if we followed it, we would eventually reach the road camp and our car.

Coming through another river gorge, Urs noticed he did not have the ice axes, so he retraced our steps while I stayed with our packs. Eventually, I climbed onto a hill and sighted the road camp with the binoculars, and then I saw Urs return from very far away. A strange feeling watching someone through binoculars when he is not at all aware – especially someone you love.

We rested awhile then trudged on through the mud to the road construction camp. Close to the entrance, we noticed some fossils in broken limestone. Found some lovely leaf fossils there while hacking away with our axes.

At least we had something to show all those excited people when we walked into the road camp. They thought we were even crazier than they had thought before to be interested in such rocks! The engineer of the camp insisted that we have a huge meal, which was delicious Iranian food. He also told Urs where to find some fish fossils. How exciting! They were also interested in our seeing bear tracks – they were obviously fresh – then they marveled that we would go to such a place without a gun. Oh well!

Off we drove on a very muddy road. Eventually, our car got stuck about 3 miles from the camp. And it was getting dark and starting to snow and be very cold. And what a gluey mess. Clay rather than mud. We had to put a huge rock under the carjack. Bloody fingers and mud and snow. Finally got going, what a mess. The engine was in the back because it was a Volkswagen bus, and we needed to put as much weight on the back tires as possible. So I jumped over the engine to sit on the tires, and got the car muddy in the process.

Later on (a few miles), we came to the place of the fish fossils. Urs went gleefully off in the snow to dig around, while I stayed inside in dry clothes wrapped in a down bag and wrote a letter to my sister Stella.

Some guys from the road camp came by to talk to me, and one helped Urs dig. They evidently drove out to help people who were stuck in the mud.

We drove Urs' helper to Shar-e-kord and then spent a few minutes finding a not-so-quiet place to sleep along the road with a whole batch of fossil fish.

The next day we went down to Isfahan and spent a very long time at the School for the Blind – run by some missionary types we had met before in Isfahan. It was good of them, and we had an empty kitchen to work in. We slept there in the car one night.

* * *



The cave and statue of the ancient (AD 240–272) King Shapur I of the Sassanid empire, 1972.

From Isfahan we drove South and visited the town of Shiraz. From Shiraz, we traveled East to Kazerun and Bushehr at the Persian Gulf. On the way, we visited the cave with the colossal statue of Shapur I, the second king of the Sassanid empire (AD 240–272). The statue was carved from a single stalagmite and was probably destroyed about 1400 years ago when the Arabs invaded the Sassanid empire.

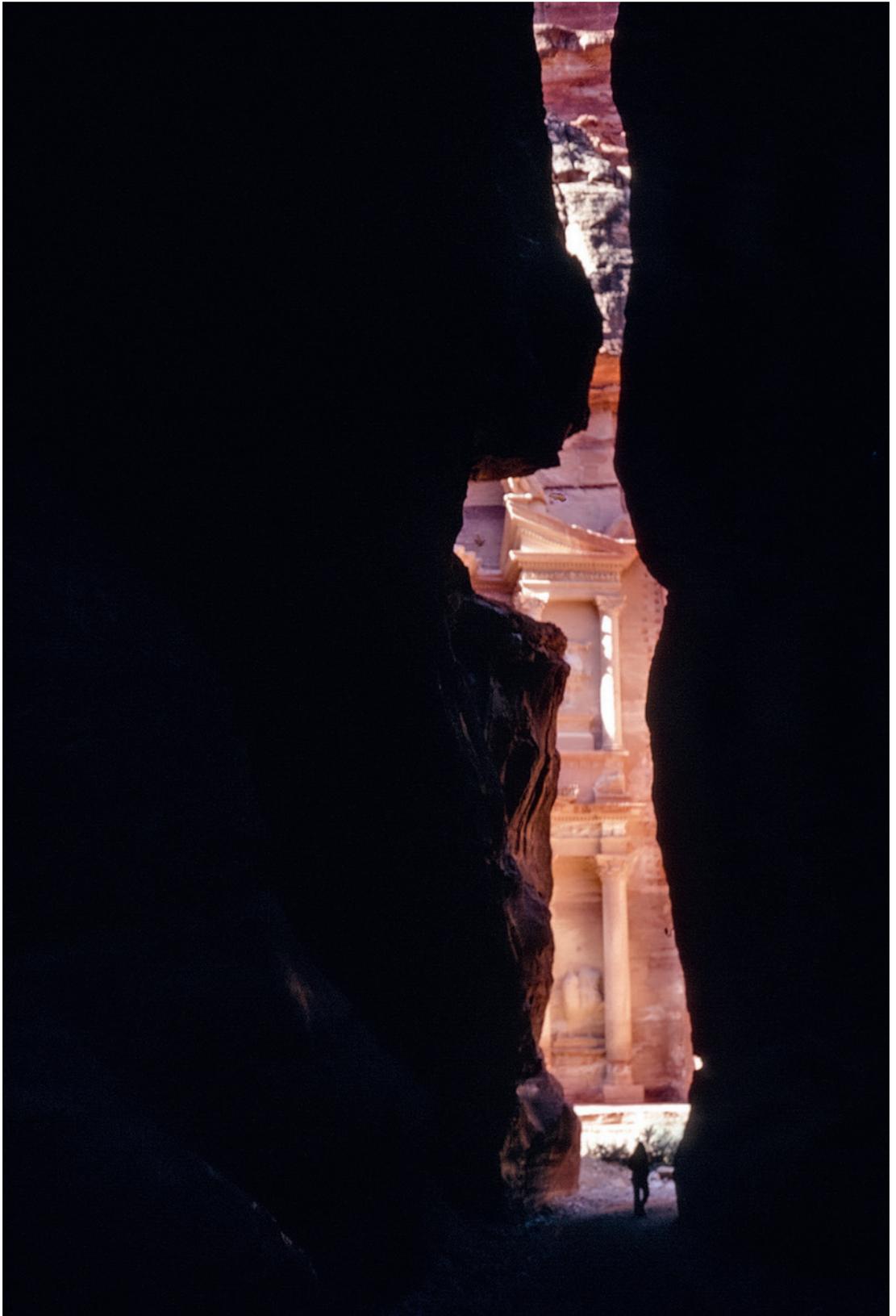
Bushehr was the biggest military airport in Iran and therefore strictly under military protection. We drove to the beach of the Persian Gulf and settled down for the night. It did not take long until a sergeant appeared to check us out. We were lucky he spoke English, was friendly, and offered us a fish for dinner from the kitchen of his platoon stationed nearby. Around midnight, we got a second visit from a guard with a bicycle and a gun slung over his shoulder. He did not speak English, but with a lot of gesticulations, I managed to get him to accompany me to the military platoon, where the soldiers explained the situation to him.

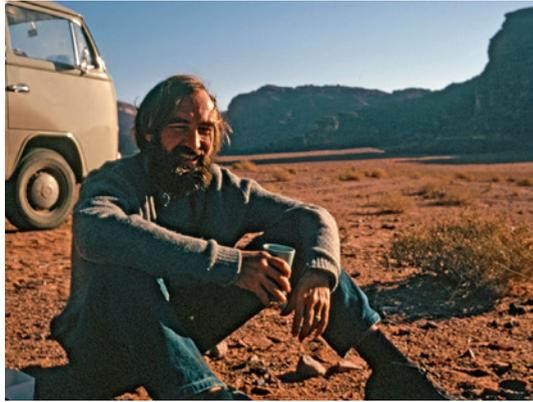


Hospitable Iranian villagers who led us to the Elamite reliefs
(dated about 2400 BC) high on a rock wall nearby, 1972.

From Bushehr we drove back east to Kazerune and then west toward Ahvaz. This drive went through a wild mountainous desert where we hardly met a soul. On the way to Ahvaz, we were lucky to encounter a local hitchhiker who showed us the way to some reliefs near Fehlian village, which date back to the Elamite times 2400 years BC. The reliefs were on a rocky spur above and accessible only via an exposed staircase in the rock face. What a marvelous view of a dry, rocky valley and river below. We would never have found it without the help of some nearby villagers who were so friendly and honored to have visitors from so far away. They invited us in and served us drinking water, which we felt we could not refuse. It made me promptly sick afterward (Harriet declined the invitation).

As we neared Ahvaz, large burning gas flares illuminated the sky from the center of the largest oil fields in Iran. From here, we traveled North via the ruins of ancient Susa to Kirmanshah, the border crossing station with Iraq. At the time, Iran and Iraq were at war, and we did not know what to expect.



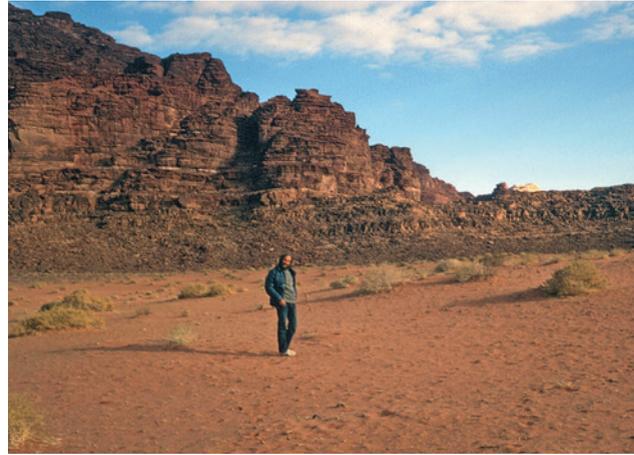


We visited beautiful Petra in southern Jordan and explored Wadi Rum, 1972.

What happened was that the Iranian border control sent one car at a time into no-man's land. After driving past the Iranian military positions pointing their guns toward Iraq, one arrived at the Iraqi positions – pointing their guns in the other direction. It was quite nerve-racking, and we were very relieved to get through. From the border, we drove safely and soundly to Baghdad.

* * *

We stayed only a few days in Baghdad. Harriet was somewhat intimidated because few women went out at night to restaurants, and, of course, none of whom wore pants. The visit to the main museum was unforgettable. From Baghdad, we drove straight through the desert toward Amman (the capital of Jordan) with just one stop at an impressive Ziggurat, where an irate cleric chased us away. At the border to Jordan, they asked us to unload the car for inspection. That made me quite angry, but, in the end, the Jordanian officials helped us reload, and with a smile, one of them gave us an apple and said, “Welcome to Jordan.”



From Amman, we drove toward Aqaba, stopping at the ruins of ancient Petra and Wadi Rum. The visit to Petra was amazing. The approach from the East goes through a narrow gorge only 10–13 feet wide in certain places, which then opens up into a sandy plain, surrounded by an array of ancient buildings carved into the surrounding cliffs. It was the capital of the Nabataean Kingdom, dating back to the 4th century BC. Its population peaked at 20,000 and was abandoned in the early Islamic period.

Wadi Rum is close by on the way to Aqaba. It is one of the most beautiful deserts we saw on our trip. A platoon of Jordanian soldiers welcomed us, invited us for coffee, and let us camp nearby. I went for a climb near our camp and promptly got stuck. Harriet went for help to the soldier camp, and eventually I was rescued.

We stayed for several days in Aqaba. Our goal was to go diving in the Gulf of the Red Sea, which we were allowed to do with the escort of a Jordanian soldier. On our diving trip, we met three jolly Italian tourists with whom we went snorkeling for 3 more days, having a terrific time admiring the corals and beautiful fish.





Snorkeling in the Red Sea near Aqaba, Jordan, 1972.

It was getting close to Christmas, and we felt it was time to get home to Switzerland. We took off straight North toward Damascus, with one impressive side trip to the ancient Syrian town of Palmyra. It had been destroyed by the Timurids in 1400. When we visited, it was a town of ruins in the desert. Walking through this abandoned town with nobody around us was a strange feeling. It was like going back in history. Just a few guards were protecting the place, and they welcomed us with some grapes.

After Palmyra, we traveled to Damascus and then back home through Turkey, Istanbul, Bulgaria, Yugoslavia, and Austria. We arrived in Switzerland on Christmas Eve 1972.

This was the most remarkable trip we ever made, loaded with history. Our return was close to the Yom Kippur War that started in October 1973. It was tense to travel along the border between Israel and Syria. Perhaps this was why we never encountered many tourists. Especially in the desert, we often traveled alone for several days. We will never forget this trip.

Our Time at the University of California, Berkeley (1972–1976)

When I fell in love with Harriet, she already had a bachelor's degree in Nutritional Science from Pennsylvania State University and a master's degree from Oregon State University. She had intended to continue her studies to obtain a Ph.D. and had already garnered a stipend to enter graduate school at the Department of Nutritional Sciences of the University of California in Berkeley with Professor Doris Calloway as her supervisor.

I was lucky. When I think back on my career, the Geneva work determined everything. Somehow, wherever I wanted to go, I could go. Stuart Linn, with whom I had collaborated in Geneva in Werner Arber's laboratory, had been hired at UC Berkeley as Professor in the Department of Biochemistry. He offered me a position as a Research Biochemist and part-time lecturer. This department was located next to the Department of Nutritional Sciences building where Harriet studied. Hence, we did not have the dilemma of many couples in science who could not find positions at the same institution. There's something to be said about the universality of nutrition research, and all universities need basic DNA research. So, we just never had problems finding jobs together.

We bought a charming house on Euclid Avenue within walking distance from the UC Berkeley campus near the Rose Garden, a beautiful park with a view over the bay toward San Francisco. Our house was situated in ideal surroundings. I will never forget the giant redwood tree right across our fence. It was sometimes hard for me to concentrate on science rather than fixing my gaze on the house and garden and caring for the children. We also lived



Harriet, Matthew, and Letitia on the porch of our home in Berkeley.

near a busy park with a long cement slide built into the hillside where the kids would frequently play.

We were now a real family, and priorities changed. Matthew completed grades 5-6, while Letitia attended grades 7-8. It was “hippy” time in Berkeley, a time of racial unrest and change, both in Berkeley and across the United States. Matthew and Letitia witnessed the demonstrations on campus. Students were being bussed to areas away from their homes to equalize their social environment. I still remember when the kids would worry sometimes that the “white kids” were rumored to be targeted for bullying, especially during the chaos of the teacher strikes. Being academics, Harriet and I assigned them reports to do instead of going to school. Despite such difficulties, it was also a time of optimism. Yes, there were problems, but people felt they were solvable. Matthew is proud that the school he was bussed to was the same school the future U.S. Vice President, Kamala Harris, attended many years later.

Berkeley was always exciting. It was just after the 1960’s. To be there in that place was pretty cool. There were streakers. Students frequently demonstrated for racial and social issues as well as for protecting the environment. I vividly remember one guy who advertised the sale of real estate on the moon. Others would fill every parking space with carts filled with flowers, calling it “the People’s Garden.” University professors gave lectures dressed in T-shirts and bandanas. However, for most, science was still a priority. I continued teaching the kids my love of nature and some of my Swiss upbringing - hiking, camping trips, and rock-climbing.

Harriet’s Ph. D. project analyzed the nutritional environment of the Hopi Indigenous People in Arizona. Her thesis title was “Strontium and Lead in the Hopi Nutritional Environment and Teeth.” It entailed many trips to visit the Hopi region in Northern Arizona, collecting and analyzing local food items and exfoliated teeth of children, and conducting dietary interviews. Harriet became pregnant during her studies, which contributed greatly to her popularity among the women in the tribal villages she visited. They called her the tooth fairy, with her big belly, going around collecting teeth. She completed her degree in 1976. Some of these women are still her friends today.

Our son Peter was born in Oakland Kaiser Permanente Hospital in the wee hours of December 24, 1974. What a Christmas present! I was rather

scared because I knew about genetic disorders from my research in DNA repair. But when he was born, and we counted all the fingers and toes, we were so happy. I was already happy with our family with Matthew and Letitia, and this made it even better.

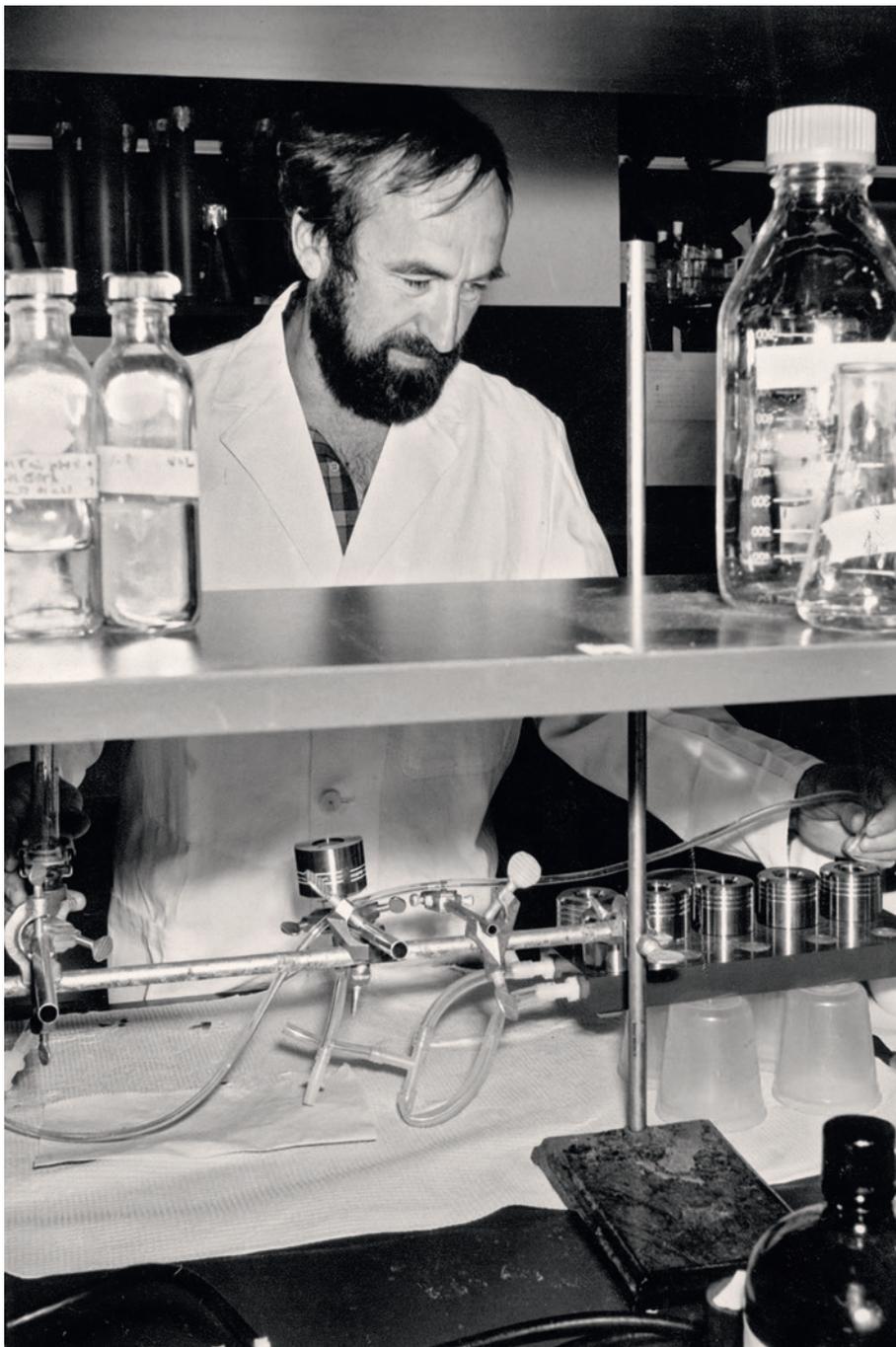
Research in Berkeley on DNA Repair

In the meantime, I was spending my time in the laboratory. After joining Stuart Linn's research group, I started to work on human genetic disorders that predispose to cancer, particularly diseases that involve deficiencies in DNA repair. One of these diseases was xeroderma pigmentosum (XP), a disease that renders patients extremely sensitive to ultraviolet light, leading to cancer in sun-exposed areas of the skin. Besides being sensitive to UV light, patients may also develop various nervous system problems, such as loss of intellectual functions and seizures. Life expectation is shortened by 30 years on average.

Experiments with cultured cells from XP patients indicated that they were deficient in removing damaged nucleotides from their DNA, raising the possibility that they were deficient in one or several enzymes involved in DNA repair. In the late 1970s, the time of our research, few such enzymes had been identified in mammalian cells.

We first focused on analyzing two enzymes, apurinic/apyrimidinic endonuclease and uracil glycosylase, key enzymes in maintaining DNA integrity. We found that the kinetic properties of XP patients were altered in cells from two groups of XP patients (Kuhnlein et al., 1976). Uracil glycosylase was also reduced in some cell lines from XP patients (Kuhnlein et al., 1978). How the altered properties of these enzymes relate to the symptoms associated with the clinical symptoms of XP has still to be elucidated.

KUHNLEIN, U., E.E. PENHOET, and S. LINN. *Altered apurinic DNA endonuclease activity in group-A and group-D xeroderma pigmentosum fibroblasts*. Proceedings of the National Academy of Sciences of the United States of America, 1976. 73(4): pp. 1169-1173.



Urs in the Berkeley lab, 1975.

KUHNLEIN, U., B. LEE, E.E. PENHOET, and S. LINN. *Xeroderma pigmentosum fibroblasts of D group lack an apurinic DNA endonuclease species with a low apparent Km*. *Nucleic Acids Research*, 1978. 5(3): pp. 951-960.

The paper describing the altered apurinic apyrimidinic endonuclease activity was the most cited research paper in my career (2021: 260 citations), indicating the importance of this paper in the research of other scientists. It was selected as one of the most significant papers in cancer research in the year 1977 and was published in the *Yearbook of Cancer*.

Since our work in 1976, much progress has been made in understanding the mechanism of DNA repair in mammalian cells and the consequences of repair defects to human health. Reviews include *The Enzymology of Apurinic/Apyrimidinic Endonuclease* (Doetsch & Cunningham, 1990³; *DNA Glycosylases: in DNA Repair and Beyond* (Jacobs & Schär, 2011)⁴; and *Xeroderma Pigmentosum* (MedlinePlus, 2023)⁵.

Vancouver Life (1976–1985)

While Harriet was finishing her Ph.D. in Berkeley, we started to search for new academic positions for both of us. Harriet was offered an assistant professorship at the University of British Columbia (Vancouver) in the Department of Family and Nutritional Sciences. I obtained a research scholarship from the National Cancer Institute at the B.C. Cancer Research Centre in Vancouver, with a joint position as assistant Professor in the Department of Medical Genetics of the Faculty of Medicine.

Our travels between Vancouver and Berkeley in those first few months brought us another border surprise. I had retained my US green card, but,

3 DOETSCH, P.W. and R.P. CUNNINGHAM (1990). *The enzymology of apurinic/apyrimidinic endonuclease*. *Mutation Research/DNA Repair* 236:173-201.

4 JACOBS, A.L. and P. SCHÄR (2012). *DNA glycosylases: in DNA repair and beyond*. *Chromosoma* 121:1-20.

5 MedlinePlus [Internet]. Bethesda (MD): National Library of Medicine (US); *Xeroderma Pigmentosum*. Available from: <https://medlineplus.gov/genetics/condition/xeroderma-pigmento-sum/>. Retrieved on 21 February 2023.



Professor Urs Kuhnlein and Professor Harriet Kuhnlein
at the University of British Columbia, 1978.

at the time, Harriet was primarily employed at the University of British Columbia (Canadian Landed Immigrant) and still had American citizenship.

We both established permanent Canadian residency. So I was a Swiss with an American green card and Canadian residency, and Harriet was American and Swiss with Canadian residency. I remember one trip back to California where the border agent at the airport looked at our papers and questioned how I could have an American green card with permanent Canadian residency. He insisted I couldn't be both, confiscated my green card, and cut it up. We were both in awe.

In the beginning, Vancouver was challenging. Harriet worked full-time at a demanding, intense academic position, and I was in my lab. We had an 18-month-old, two teenagers, a Swiss *au pair* (and later another *au pair* girl from Germany), a housekeeper, and two cats. We bought a beautiful house in the Shaughnessy area amidst villas with large tree-filled gardens. Each of the kids had their own room. Schools were nearby. I had more time to do all the



Our Vancouver Home.



Our family settling into Vancouver, 1978.
From left: Matthew, Urs holding Peter, Harriet, and Letitia.

“Peter” things: I took shifts at his daycare, cleaning up in the evenings, and being a parent assistant. I was the only father among all the moms. Eventually, Peter attended kindergarten and then elementary school. Matthew went to middle school and high school with Letitia in Vancouver. Coming from Geneva, we already had an international mentality, so we enrolled Peter in French immersion class, and he is now fluent in French.

Moving from Switzerland to Stanford and then from Berkeley to UBC was interesting. The science wasn’t as exciting, but our family and the surroundings made up for it. One special memory is our canoe trip in the Yukon Territory of Canada. We drove our Land Cruiser to Whitehorse, where we rented canoes. Then, we paddled down the Yukon River for 2 weeks to Dawson City. Peter was 8 years old. Harriet, Peter, and I met up with Letitia and her boyfriend, Mark. Matthew was supposed to come, too, but his girlfriend was afraid of bears and did not want him to go.

We’d been camping on Lake Laberge when an awful storm came and blew all our plastic waterproof bags into the lake. I grabbed Mark, and we got into the canoe to retrieve the bags. We made it back just in time. Mark had had enough at this point, so he and Letitia returned home to Vancouver.

After the storm, we had to pitch our tent deep into the trees away from the shore because the wind was so fierce. I remember it was a beautiful, full moon night, and Harriet was sleeping with her head in the corner. In the middle of the night, she heard scratching; little chipmunks and other critters kept running across the corner of the tent, just inches from her head inside the tent. She screamed and stood up inside her sleeping bag. I was still half asleep and thought she was a bear, so I kept saying, “Go away, go away!” Finally, after I woke up fully, she convinced me that she was *not* a bear. Now, just the three of us, Peter, Harriet, and I, continued our trip, ending in Dawson City, Yukon.

I remember another trip in the 1990s in the Canadian province of Yukon, this one with some good First Nations friends of Harriet’s. We were in a boat duck hunting, and every time Norma lifted her gun to shoot, I stealthily rocked the boat to throw her off balance, so she missed every shot. So, my love of animals surfaced again. Norma just looked at me and smiled!

At a very early age, Peter started playing violin using the Suzuki method, which helped him succeed. I, too, had started playing violin as a child. My entire family was musical; we would gather and play Christmas songs together each Christmas. My mother played the piano, my oldest brother and father played the accordion, and my other brother played the flute while my sister sang. We'd give concerts to the aunts. It's a very fond memory.

I took violin lessons in high school but was never interested enough to work hard at them. Then, in Berkeley, some friends and I formed a quartet. I enjoyed it very much and even started taking lessons again. Unfortunately, my teacher got sick, but I had found a renewed love for the violin. So when Peter came along, I dreamed of playing Christmas music again. Well, when he was about 7, I remember Peter asked his violin teacher, Mrs. Butler, if she were wearing a bra. That showed me his interest in the violin, so we decided it was probably time for him to stop playing it. Later in high school in Quebec, he would take up the clarinet - and he was so good! He was in the student orchestra, and I was so proud to attend his recitals. To this day, we still stop and listen whenever we hear the Mozart clarinet piece Peter played. I kept that clarinet a long time, hoping he might pick it back up again.

One particularly special event was Dr. Arber's Nobel Prize Party. Dr. Arber was awarded the Nobel Prize in Physiology or Medicine in 1978. In 1979, he spent the award money to fly his friends, colleagues, and their spouses from the Geneva days to Sils Maria in Switzerland and host them for a wonderful week-long party. All the guests stayed at the Nietzsche House and were treated to delicious food every day. In the mornings, we'd gather and give science talks, each updating the group about our current work and research. Then, we'd go for hikes in the afternoon, followed by wonderful evening meals and conversation. It was a truly nice time, and I felt honored to be there.

Research at UBC and the BC Cancer Research Centre (1976-1985)

My time at UBC was spent chiefly doing research. Harriet was a full-time professor with all the teaching, research, and committee assignments. I was never hired for my teaching and taught only if someone else went on a sabbatical or they needed a guest lecture. Our lab was in the BC Cancer Research Centre, close to the hospital, in a building called “The Bakery” because it had formerly been a commercial bakery. I also had a cross-appointment in the Medical Genetics Department on campus, but my salary came from the Institute of Cancer Research of Canada.

Working with graduate students and talking about the science is always a great pleasure. I loved them all, and they loved me. They were at a place where they would get excited and curious and have great discussions and arguments. It was marvelous. Like my time in Switzerland, the students and professors would take day hikes in the nearby mountains.

Both Harriet and I were fortunate to be friends with Nobel Prize winner Michael Smith (Nobel Prize in Chemistry 1993). His biochemistry department was adjacent to the Cancer Research Institute on campus. He had known about my work with Dr. Arber on modification and restriction, so I gave a lecture in his class.

My first Ph.D. student was S.S. Tsang. I was very proud of him when he finished his work, a continuation of my work in Berkeley, aimed at elucidating the mechanism of DNA repair. It involved two basic aspects: 1. deducing the chemical nature of DNA damage recognized by cells and 2. identifying the cellular proteins involved in excising damage from DNA and restoring the original DNA helix.

Because the chemical nature of DNA damage recognized by cells is so diverse, we hypothesized that a change in the structure of the DNA helix is recognized as damage to be repaired - not the chemical alteration of a DNA base. Working with the circular genomes of phage as a substrate, Tsang found that PM2 DNA can undergo a salt-induced structural change similar to a transition from B-DNA (right-handed helix) to Z-DNA (left-handed helix). He found that this transition is also promoted by bulky DNA damages such as those caused by the junction between B-DNA and Z-DNA, which are

highly mutagenic unless DNA repair systems recognize them⁶. It is, therefore, possible that only bulky DNA lesions are recognized and repaired not by their chemical nature but by their influence on the DNA helical structure.

Tsang searched for DNA binding proteins in extracts from cultured cells and found a DNA binding using PM2 DNA as a substrate. This binding requires that the PM2 DNA be supercoiled and exposed to a bulky DNA-damaging agent. The requirement for supercoiling suggests that Z-DNA is involved since supercoiling promotes the formation of Z-DNA. Tsang also analyzed four cell lines from XPA patients and found that patients belonging to the complementation group A lacked a single-stranded-DNA binding activity, but that the binding protein with a preference for supercoiled damaged DNA was present in all XPA cell lines (Tsang & Kuhnlein, 1982; Kuhnlein et al., 1980).

TSANG, S.S. and U. KUHNLEIN. *DNA-binding protein from HeLa-cells that binds preferentially to supercoiled DNA damaged by ultraviolet light or N-acetoxy-N-acetyl-2-amino-fluorene*. *Environmental Mutagenesis*, 1982. 4(3): p. 401-402.

KUHNLEIN, U., S.S.TSANG, and J.EDWARDS. *Cooperative structural transition of PM2 DNA at high ionic-strength and its dependence on DNA damages*. *Nature*, 1980. 287(5780): p. 363-364.

6 MCKINNEY J.A., G.WANG, A.MUKHERJEE, L.CHRISTENSEN, S.H.S.SUBRAMANIAN, J.ZHAI and K.M.VASQUEZ. *Distinct DNA repair pathways cause genomic instability at alternative DNA structures*. *Nature Communications*, (2020)11:236. <https://doi.org/10.1038/s41467-019-13878-9>

Collaborating with Harriet at The University of British Columbia

Because my research concerned assays for mutagens as well as the analysis and detection of DNA damage, I could develop a collaboration with Harriet and her students. She had a colleague in the Department of Nutritional Sciences at UC Berkeley who conducted a controlled formula diet study in humans to see whether nutritional deficiencies lead to the formation of mutagens in fecal matter. That occurred close to the end of our time in Berkeley, and we thought it sounded pretty interesting. Another friend and neighbor in Berkeley, Professor Bruce Ames, was a master at creating assays for mutations, so when we decided to get serious about studying fecal mutagens, it was natural to reach out to Bruce for help in defining an assay, which he did. The result was our controlled formula diet study, which aimed to see whether the diet that determines the fecal mutagen level might induce cancer. We found that people on identical diets had different levels of mutagens in their feces.

After 72 days of a carefully controlled diet, we discovered no significant change within a subject for fecal mutagenicity. It appeared that long-term habits – dietary or otherwise – or perhaps genetic traits are the major factors influencing mutagenicity. This started the collaborative research we conducted at the University of British Columbia in Vancouver (Kuhnlein et al., 1983).

KUHNEIN, H.V., U. KUHNEIN, and P.A. BELL. *The effect of short-term dietary modification on human fecal mutagenic activity*. Mutation Research, 1983. 113(1): p. 1-12.

At UBC, Harriet and her team had to develop projects for her graduate students. She had seven in her first year, and the fecal mutagen study made it easy to collect samples. Two master's students began experimenting on themselves. One of these students got quite excited to look at her sample after she had consumed beets for dinner. They went on to complete the studies on vegetarian and nonvegetarian diets to show that samples from nonvegetarians had significantly more mutagenic activity, indicating that eating meat might predispose to colon cancer (Kuhnlein et al., 1981). The



Matthew and Letitia in Vancouver, 1978.

fecal mutagen publications ultimately received good reviews in the cancer literature, leading other researchers to follow this line of experiments. Today, it is common public health advice to avoid excess red meat consumption to avoid possible cancer risk.

KUHNLEIN, U., D. BERGSTROM, and H. KUHNLEIN. *Mutagens in feces from vegetarians and non-vegetarians*. *Mutation Research*, 1981. 85(1): p. 1-12.

I remember that we didn't make a point of mentioning this side project of fecal mutagens to my supervisor at The Bakery. A visitor came to the lab, and he got very excited about the fecal mutagen studies, thinking it might be related to the cancer research work of the lab. My supervisor was surprised and embarrassed that he knew nothing about this work - and got very mad. I think he actually wanted to get Harriet fired.

Harriet had a desk in my office at the Cancer Research Centre and an office and a lab in her department on campus. She would work with her students to get the subjects and the samples, and she would assess the subjects' diets to ensure that those recruited were indeed vegetarians (or not), and that they had been instructed how to properly collect their fecal samples. The students would interview the subjects, collect the samples in a box with dry ice, and then transport them to my lab. There, they would homogenize and centrifuge the samples we'd use for the assay.

I still remember Letitia and Matthew constantly complaining when we talked too much about our research during dinnertime. Teenagers don't want to hear about that kind of thing. I also vividly remember bringing fecal samples from an experiment with Harriet's former Berkeley laboratory to our Vancouver laboratory. The customs official at the border was suspicious about what was in those boxes with dry ice, which left wet spots on his counter, and asked what was in those boxes. When I told him that they contained fecal samples packed in dry ice, he waved us through without further inspection and looked the other way.

The Ascent of Denali and Other Adventures (1977)

In 1977, I received a phone call from Bill Dimpfl, a friend from my time at Stanford. He and some friends wanted to climb Denali, the highest mountain in Alaska, via the East Buttress and needed an additional partner. Will Spiegelman, a good climbing friend and my best man from our wedding, was supposed to go but had to cancel.

Denali is the highest mountain in Alaska (6,190 m), and in 1977, the buttress route had been climbed only once before. Of course, I said yes. I did some training to get in shape, walking or hiking every weekend and even cutting the lawn in heavy double mountain boots with Peter in a backpack. We had an old push mower that got rustier and harder to push with each round. I added rocks to my backpack to up the challenge. Family life followed me on this climb: Once I reached base camp, I found a small toy little Peter had put in my boot unbeknownst to me.

Our climb wasn't particularly technically difficult, but the weather continually threatened us. It became one of my most precious memories, and I would like to include the account of the climb given by Rick Meining, with whom I was roped up during almost the entire climb. Rick and I were the only ones with skis, which we used on the lower part of the climb.

The following is the description of our ascent as described by Rick Meining in *Summit*, December 1977. Meining refers to the mountain as McKinley in the article. It only officially became Denali in 2015 after President Obama and the Secretary of Interior worked to restore its Indigenous name.



Landing by plane on Ruth Glacier.

As I stepped off the train into the bright sunlight of dusty Talkeetna, I realized that my pre-expedition fears and anxieties had mysteriously faded. Hardly had I taken notice of Talkeetna or the incessant mosquitoes when I was informed that I should be ready to leave within the hour. With that, my pulse quickened, and a butterfly fluttered to the pit of my stomach. With amazing inefficiency, I began unpacking some of the expedition's 1,200 pounds of gear. Talkeetna's sweltering June heat only intensified my disbelief that I would soon be committed to McKinley's icy eastern flanks. My mind was overwhelmed by a plethora of unknowns and anticipated difficulties – I desperately wanted to confront McKinley once and for all.

McKinley's East Buttress had been a single-minded passion since the previous December, when I met fellow Boston climber Bill Dimpfl. Bill had long been searching for a technically challenging, rarely climbed route on McKinley and had decided on the East Buttress that had been climbed only once before. Mike Syvanen, Urs Kuhnlein, and Peter McGann – all California acquaintances of Bill – comprised the remainder of our group. Bill diligently organized trip logistics and researched the route throughout the previous spring and fall. On June 27, from various parts of the country, Bill, Mike, Urs, and I met in Anchorage. Later in the week, Peter joined us at the Ruth Glacier.

Over 7 months of anxiety and a hectic weekend dealing with 1,200 pounds of excess baggage on the airlines preceded the Talkeetna arrival. Once I settled behind the pilot in the ski-equipped Cessna among the jumble of food bags, ice axes, packs, ropes, and assorted gear, the reality of the adventure began to coalesce. As the plane banked northward toward the Alaska Range, I eagerly searched through the patchwork of clouds for verification of McKinley's existence. Shortly, the plane was needling its way along the 38-mile Ruth Glacier. Impressive granite walls rose precipitously to either side while the greenery to the south receded. Only the plane's minuscule shadow on the Ruth below indicated the vastness of the glacier and its mountain walls. The mountains were even more awesome for their stark lack of color. This was a world of muted earth tones, intense whites, and azure blues. The plane's crisp landing abruptly interrupted my fixation on the scenery. After being deposited in the Ruth amphitheater, Bill and I, overwhelmingly alone, awaited the pilot's return with Urs and Mike.

By early evening, the four of us were reunited at the Ruth landing strip. Whether it was awe or impatience, we were all struck with a sense of immediacy



Bill Dimpfl, leader of the team, at the first camp of the climb.



East Buttress between camp I and II.
Bill Dimpfl leading the first difficult climb.



Up the Ruth Glacier from the landing strip toward the start of the East Buttress climb.

that necessitated a prompt start. Our climbing goal, at times visible through the clouds, was a sobering 8 miles away. With heavy packs and bulky sleds, we left the 5,400-foot landing site on snowshoes and skis. Bill and Mike speedily negotiated through the first band of crevasses, while Urs and I discovered roped skiing and sled-hauling techniques. The first evening was especially trying since my sled load continually fell apart. Despite the mild winter, conditions on the Ruth were extremely favorable, with numerous sound bridges across the crevasses. Within 3 days, we were poised to establish base camp at 9,200 feet. Urs and I, however, returned to the landing site to wait for Peter's arrival. Mike and Bill meanwhile established base camp and began pushing the route through the first seracs. After 3 days of separation, our party of five was united at base camp.

Our first week on the glacier had brought marked changes in the group. We were now comfortable among our vast settings and were functioning well together. The numerous avalanches from the surrounding walls – still awesome – were now noninterrupting daily events. Our quick and incident-free progress up the Ruth glacier had filled the group with reassuring confidence. Additionally, we were adjusted to moving in stable but marginal, weather. Our meals were consistently appetizing and varied. Long days or nights of climbing and load hauling had become normal. More importantly, we had a group identity and a flourishing camaraderie.

From base camp, ropes were fixed and loads ferried in near whiteout conditions. Within 2 days, camp I was established on a prominent knoll beneath a band of menacing seracs. While excavating the campsite, Peter, our expedition doctor, cut his thumb with the snow machete. Under Peter's tutelage, Urs and Mike stitched the wound enabling Peter to climb largely unhampered.

From our 11,100-foot vantage point, we were treated to some impressiv views of the frequent massive avalanches pouring from Thayer Basin over the mile-high East Face. Needless to say, we would subsequently view our own seracs with nervous suspicion. Bill and Mike took advantage of the clear night and pushed the route up through the seracs on July 7. Loads were ferried to the top of the fixed line to an airy perch later dubbed the "high raven cache" in deference to a large, hungry visitor. Despite hastily improvised "raven death calls," this enormous bird persisted in visiting the indefensible food bags. From the raven cache, Camp II was an additional 500 feet above, at 12,400 feet.



Top of the East Buttress. The hardest part of the climb is over.



East Buttress on the way to the second camp.



A view of the upper part of the East Buttress. The serious part of the climb begins. Our track can be seen on the lower right.

We established Camp II under mercurial skies that brought intermittent snow, hail, and brilliant sun. We again pitched our camp directly below a broad band of seracs. Mike and Urs had first crack at this serious obstacle – our first difficulties that threatened to halt our steady progress. Our only hope lay in skirting below the overhanging wall to a high-angle ice ramp that appeared to lead through the seracs. Bill, Mike, and Urs boldly negotiated the crux ramp and fixed the line to 13,700 feet. Peter and I later in the day pushed the route an additional 600 feet, up an extremely exposed 46–60-degree ice field on the buttress. Our next trip would likely be to the buttress top! On Monday, July 11, Bill and Mike finished the upper ice slopes and continued to the buttress summit. Hauling loads below and through the ramps proved nerve-wracking as the seracs moaned and creaked throughout the day. Happily, Peter, Urs, and I began to move camp Monday night. We reached the buttress summit shortly after 2 a.m. and were unexpectedly treated to a spectacular sunrise. The fiery hues, scintillating snow crust, and serenity of the mountain more than soothed my exhausted mind and body. I could sense the unspoken satisfaction in my partners as they, too, witnessed the sunrise. Later in the morning, we reached the buttress summit, passing Bill and Mike, shortly after 2 am.

However, the summit of McKinley was still 6,000 feet above us. Whiteout conditions had unexpectedly descended and confined us to our tents for our first real rest day. On Wednesday, we broke camp in intermittent weather and began our 700-foot descent into Thayer Basin. Weather again halted our progress for most of the day, but we continued to move at the slightest hint of clearing cloud cover. Time was almost as indistinct as the perpetual whiteouts we were experiencing. Thoughts of remote beaches, food, and friends foggily drifted through my mind as I mechanically plodded through knee-deep snow. Thursday saw us confined to our campsite in Thayer Basin under heavy snow and cloud cover. We abandoned our original plan to ascend a series of unclimbed summit couloirs: more steep ice requiring fixed rope, uncertainty in weather, and acclimatization made Thayer Ridge a better alternative.

We attained Thayer Ridge after a few exasperating moments on ice, covered with avalanching powder snow. We pitched camp at 16,000 feet beneath an overhanging boulder, provoking numerous allusions and scenarios about the tent pole's ability to support such a rock. It struck me as a humorous campsite



Urs reaching Thayer Ridge.



Mike Syvanan at camp on Thayer Ridge
with a glorious view of the mountain scenery.

despite my persistent headache and exhaustion. After a restful night at our rock camp, we pushed on to high camp. The ridge varied in character – at times a delightful knife-edge or a character-building slog. Frequently, the scenery and climbing were so enjoyable that I felt a childlike playfulness. Sometimes, the labor was backbreaking, and my mind aimlessly drifted from thought to thought. Only an occasional rope tug interrupted my world of fantasy. Early in the afternoon, camp was pitched in a wind-carved hollow at 17,400 feet, below the rocky ridge. I was glad that we had stopped while we were all still fit. Moods were buoyant as the weather remained suspiciously clear. I looked forward to a double dinner Saturday night to assuage my ever-growing appetite. During dinner, I saw in my companions' bearded, haggard faces that the summit was close at hand. Despite our excitement, the conversation was subdued. My sleeping bag was invitingly warm, and I quickly drifted off to sleep envisioning Denali's summit.

On Sunday, July 17, we awoke to a clear, painfully bright day. I wolfed down my granola breakfast – probably a result of adrenaline. Recollections of earlier tragedies crossed my mind while I packed a minimum of survival gear. Despite our early start, we only managed to leave camp at 9 a.m. Bill set a brisk, manageable pace, but the summit continually receded with each step. My mind again drifted into thoughts of fantasy as we endlessly pushed upward. Clouds began to sweep the slopes, bringing stinging snow. I knew we must be close as high camp had vanished far below. Finally, I heard a cry from Bill and Mike several hundred yards away. Could such a small wand-studded rise be the summit of mighty Denali? We ecstatically assembled on the summit for an exchange of handshakes and pictures. My thoughts and emotions were jumbled: All preconceived notions of this moment were realized and yet not realized. It was like no other experience imaginable.

Bill and Mike had already disappeared down the slope before Urs, Peter and I haltingly began our descent. With the summit experience fading rapidly into memory, our descent was rapid but mechanical. Thoughts of a warm meal and bed were now our driving force. In three very long, strenuous days, we were again safely at the landing strip. The trip down had held as many obstacles as the ascent. Fortunately, the glacier was still in good condition for a rapid retreat.



On the summit of Denali.



Urs on the summit of Denali.



Reunion of the Denali team at Mt. Ranier National Park, Seattle, in 2021.
From left: Urs Kuhnlein, Peter McGann, Bill Dimpfl, Mike Syvanen, and Rick Meining.

However, slab avalanche debris and bits of shattered serac littered our route on the buttress. When the insect shrill of the plane echoed off the amphitheater walls, we were all eager to leave this sometimes hostile environment. I was also very remorseful to leave Denali and a magnificent adventure with four of her finest climbers.

Family Adventures

Research and science were always important, and I loved it all. I loved the questions and the hunt for answers.

But I also love the mountains. After Denali, I thought I'd never do it again. But that feeling only lasted a couple of weeks, and then I was ready to go up again. I was always more scared when I had climbed with Peter when he was little (in Switzerland) because I knew that, if I fell, he would not

be strong enough to hold me on the rope. But once Peter went to climbing school (Yamnuska Mountain Adventures in Canmore, Alberta, in the 1990s), I loved climbing with him. I felt safe with him at the leading end of the rope. There were so many mountains to climb and places to explore. Too many.

Peter was in his early teens when we first climbed in Switzerland. I remember we were heading up the little Mythen stock and came to a plaque with German writing on it. Peter asked what it said. After reading it, I told him, “Oh, it says we’re getting close to the summit!” It was actually a memorial plaque for someone who had fallen to his death from that place.

We were late coming down from the climb. This was before cell phones, so we could not let anyone know we’d be late. We were staying with my brother Klaus and his wife, Angret, and she was so worried when we didn’t come back on time. We ended up not getting back until around midnight.

Another memorable trip with Peter was the Bietschhorn (see page 19), which we did not summit. We scrambled up these random rocky side trails with our packs on our backs. We eventually camped out, and the Swiss climbers thought we were crazy because they all stayed in climbing huts, and here we were, camping out in the open.

During this time (1982–1985), Letitia attended Cornell University. I remember her saying, “If I can’t go to Cornell University, I will not go to university at all.” Cornell had been the alma mater of Harriet’s sister Estella, Estella’s husband, Ray, and their three boys. Letitia spent some of our Vancouver years with Estella in New York State, acquiring New York state residency and consequently a reduced tuition at Cornell.

Climbing in Bugaboo Provincial Park near Bugaboo Spire with Peter
in the Canadian Rockies in British Columbia in the 1990s.
Urs and Eric Terzaghi climbed Snowpatch Spire (in the back) in 1971.



From British Columbia to Quebec (1984)

In 1984, my appointment as a British Columbia Cancer Research Centre research scholar in Vancouver, Canada was not renewed. However, Malcolm Paterson offered me a position in the newly-founded Cancer Research Centre in Edmonton (Alberta, Canada). I had met Paterson when he accepted my invitation to be a main speaker at the Terry Fox Conference on Oncogenes and Cancers. I had organized that meeting with Tony Pawson of the University of British Columbia in 1983. Three of the invited speakers to this highly successful conference were later awarded Nobel prizes: M. Smith - 1993 Chemistry; J.M. Bishop - 1989 Physiology or Medicine; H.E. Varmus - 1989 Physiology or Medicine.

Since the start of my position at the Cancer Research Centre in Edmonton was still a year ahead, Paterson invited me to join him at his laboratory at the Chalk River Nuclear Research Laboratories in Ontario as a Senior Scientist. Chalk River is a high-powered nuclear research institute in the middle of nowhere north of Ottawa; it also harbored a molecular biology laboratory specializing in DNA repair. In the meantime, Harriet was looking for a new position at the University of Alberta in Edmonton. During the year I was in Chalk River, however, she did not find a satisfactory position there.

After a year-long search in Canada and the United States, Harriet and I were offered professorships at McGill University. McGill is one of the leading universities in Canada, located in the Province of Quebec at the tip of the Island of Montreal. Despite its being in a French-speaking part of Canada, its main teaching language is English.



Professor
Roger Buckland

Macdonald Campus had just hired a new dean, Roger Buckland, who was eager to expand this faculty. He offered me a tenure-track appointment when we first interviewed at McGill, but when I started applying to other opportunities, he improved my hire package. Roger saw in Drs. Urs and Harriet Kuhnlein a “power couple” and made two hires happen. Thank you, Dean Buckland.

Harriet assumed the position of Director of the School of Dietetics and Human Nutrition (later the School of Human Nutrition), and I was in the Department of Animal Science, both at the Macdonald Campus of McGill University in Ste. Anne de Bellevue in Quebec, about 15 miles from the Montreal campus. The Macdonald Campus includes the Faculty of Agriculture and Environmental Sciences of McGill University. It’s a marvelous setting, bordered by the old village of Ste. Anne de Bellevue, the St. Lawrence River, forestlands, and fields. It was a landscape with which one could easily fall in love.

Harriet began her research with the Indigenous Peoples of Canada regarding nutrition and health promotion research with the Nuxalk Nation in Bella Coola in Coastal British Columbia. Over the years, she expanded her research worldwide to reach every continent. In all, she trained more than 2,000 students at the undergraduate and postgraduate levels. Her work with the Indigenous Peoples in different cultures and ecosystems showed that documenting traditional foods and then using that information to stimulate community engagement can actually improve nutrition and health in some of the world’s most disadvantaged populations. By the time she turned 70, she had visited more countries than her age. For our family, it was great because we all liked to travel and often got to go along. We got to know so many people, and it enriched our lives.

Roger Buckland’s area of research was poultry science. He knew everything about breeding, especially egg production. One of his ambitions was to expand the newest molecular technology into animal breeding. At the time (late 1980s), molecular technology had progressed tremendously, and it was felt that such techniques would impact medical research as well as animal and plant production. He had just obtained a large grant from Shaver

Poultry Breeding Farms Ltd., in Ontario, to finance a National Science and Engineering Research Council Chair in Poultry Biotechnology, which they offered me. I think my stories of exotic species like wild turkeys, kestrels, and naked-neck chickens captured Dr. Shaver's interest. These funds were matched by the National Research Council of Canada and by Agriculture Canada. My initial task was pure research with no teaching obligations. Further, I had complete freedom to choose my research topics.

Jan Gavora at Agriculture Canada (a federal program promoting agricultural research) was head of a strong breeding program for poultry and a key proponent for using molecular biology as an adjunct method in poultry breeding. He also staunchly supported my being hired as the new Industrial Chair in Poultry Biology, sponsored by Shaver Poultry Ltd. This meant that I had access to a large breeding program with genetically well-defined chicken strains. Gavora was eager to collaborate with me, and I with him.

When Harriet and I accepted our positions at McGill (both positions were to start in July 1985), I had moved to Chalk River, and Harriet had commitments in the Arctic with the Canadian government from her home base in Vancouver. So that summer, she was packing up the house and kids in Vancouver while I was working in Chalk River. We moved to Quebec and rented a beautiful little house on Lac Saint-Louis in Île Perrot, close to the Macdonald Campus, with wildlife to watch while we house-hunted for our permanent home.

Harriet had to supervise her fieldwork with the Inuit on Baffin Island, so she took Peter, who was 10 years old at the time, with her. He started school in the community of Qikiqtarjuaq on Baffin Island, but it wasn't a very good experience for him. His teacher said he was too disruptive - our gentle, kind Peter! So Harriet arranged for a research assistant to take over her position, and she headed home with Peter to enroll him in school in Quebec. I have fond memories of taking Peter to primary school every day, and I vividly remember spending lunchtime with him at the Macdonald Campus. We trained together in the game "butts up" to provide him with a competitive edge in school against his classmates. My students were always surprised when they saw their professor playing this game in the nearby schoolyard at lunchtime.

Our Home in Baie d'Urfe, Quebec

I had already started at McGill, but Harriet returned from Baffin Island that summer. We searched and found our dream home in Baie d'Urfe. We sold our house in Vancouver and used the funds to buy our home in Quebec. It was a beautiful house on the shore of the St. Lawrence River with a large garden surrounded by trees left and right. The house itself dated back to the 19th century and was expansive. We moved in on 18 December 1985 (also my mother's birthday). It was so cold and windy with all the doors open and movers coming and going with boxes and furniture.

Though we first hesitated to buy this house that fall, Letitia talked us into it, saying, "This is it! It's so beautiful, and if you buy this house it'd be perfect for my wedding next summer." Which she did in 1986. It was the most beautiful marriage ceremony I had ever attended, full of sun and smiles. The garden was full of roses, daisies, peonies, zinnias, ranunculus, hollyhocks, and more.



Our Baie d'Urfe Home.

At the time, Matthew was at the Boston Architectural Center. He had finally fulfilled his dream, and we were always happy to have an in-house architect. In fact, he designed and built a gazebo in our garden, complete with a big chessboard and pieces and a wonderful greenhouse that reused the old windows from the house. He also built a beautiful covered deck with a stunning view of the St. Lawrence River, where we had many unforgettable dinner parties. Students and colleagues always commented on our great parties, the spectacular view, the brilliant atmosphere, and the good food and company.

Our life was in the office/lab and in the garden. It was a 10-minute walk to campus, so we'd walk to work then come home for lunch and return to campus afterward. It was ideal. I loved to walk to the college and ponder my science and what I was going to do that morning, but I could also work late into the night or go into the lab at 1:00 am to check experiments without being far from home.

Matthew also beautifully renovated a little house we bought for Letitia in the nearby village of St. Anne de Bellevue. She moved from Boston with our granddaughter Veronica to start graduate school in the Department of Plant Science at the Macdonald Campus of McGill.

Our Baie d'Urfe home was a never-ending series of renovations. The summers were gorgeous, but the winters were very severe, and we knew we didn't want to stay too long after retirement. We loved that house and stayed there for 25 years.

Our Life at McGill

What luck we had. Harriet could create a new school with several professors to hire. A few years later, as the Founding Director of McGill University's celebrated Centre for Indigenous Peoples' Nutrition and Environment (CINE), Harriet worked with Indigenous leaders to develop CINE's participatory research process to ensure successful programs with Indigenous Peoples. I enjoyed plenty of grant money and liberty to undertake exciting research, and we both became full professors at McGill University.

Appendix C (p. 147), which includes my Curriculum Vitae, shows the extent of my work. In this section, I would like to highlight some of the major findings of our research group.

The funding from Shaver Poultry Breeding Farms Ltd., which was matched by the Agriculture Canada research program and the National Research Council of Canada, gave me sufficient money to equip a new laboratory, hire a laboratory technician, and provide funding for hiring students. This allowed me to support students from many developing countries without access to US granting institutions. I supported students and visiting professors from Syria, Iran, Pakistan, Africa, Slovakia, and China, whose first and even second language were often not English. They were hard workers in the lab and would be there around the clock, but much of their writing needed help. They struggled but worked extremely hard.

I supervised 27 graduate students, postdoctoral fellows, and research associates. Together with my academic and industry colleagues, we enjoyed

a rich scientific environment in which we learned much from each other. I treasure these experiences. One thing I especially loved was that everybody in the lab was happy. We were always laughing; it seemed the happiest lab in the building.

My obligation to the funding agencies was to submit reports and give a yearly talk to the Shaver staff about the progress of poultry research worldwide. I'd show them around for a day or two and entertain them in the lab. I always felt a little guilty because I was having fun and had no way to gauge whether they could use the information I was giving them.

My approach was straightforward: I characterized the genetic variations in the genes of chickens and searched for the association of such variations with economically important traits. This required having well-characterized, genetically defined strains of chickens at my disposal - and that was where the Shaver Poultry Breeding Farms and Agriculture Canada came in.

Dr. Jan Gavora, who collaborated with me from the beginning and was instrumental in introducing me to many of the researchers in the field, supervised the breeding program at Agriculture Canada.

Our approach to identifying the genetic variations responsible for traits in chickens somewhat resembled our search to identify genetic variations responsible for the disorder xeroderma pigmentosum (XP), where we had tried to correlate genetic variations in the cell lines of patients. However, in this case, we were analyzing chicken DNA. We could easily extract the DNA from small samples of blood, which in chickens - in contrast to humans - contain copies of the entire genome.

At McGill, I always tried to avoid administrative duties, despite realizing they are necessary parts of academia. One memory sticks out: When the former President of Russia, Boris Yeltsin, came to visit the faculty, I was Associate Dean of Research and was in the welcoming reception line for the illustrious visitor. First came the motorcade, and out jumped the KGB with their guns. Then, Yeltsin appeared and was escorted into the building for our meetings. He shook my hand, and I remember not washing it for several days afterward. At the end, before returning to his motorcade, he looked toward the

crowd, saw Harriet in her pink coat and pink umbrella, and made a beeline to shake her hand, too.

Harriet and I had different working habits. She had many administrative duties and little time to concentrate on her scientific work. She often closed the door when she was working in her office. I loved the distractions and always left my office door open. I liked the interaction with students and constantly shuttled between my office and my lab.

At the beginning, I did not have to teach undergraduate courses. Later, I started to give lectures in calculus (which I had studied for my degree in Zürich and dearly loved), biochemistry, and molecular biology.

DNA Work on White Leghorn Chickens

In collaboration with Dr. Jan Gavora, the Agriculture Canada laboratories, and the Shaver commercial lines of poultry, we had access to well-defined strains of White Leghorn chickens, the main strain of egg-laying chickens used worldwide for egg production. The first genes we analyzed were endogenous viral genes (ev-genes), that is, remnants of a retrovirus permanently integrated into the avian genome in the past. The White Leghorn chicken genome contained up to 21 of these viral segments. We found some of them to be associated with traits such as disease resistance, body weight, and egg production.

KUHNLEIN U., J.S. GAVORA, J.L. SPENCER, D.E. BERNON, and M. SABOUR. *Incidence of endogenous viral genes in two strains of White Leghorn chickens selected for egg production and susceptibility to or resistance to Marek's disease*. *Theoretical and Applied Genetics*, 1989.77(1): p. 26-32.

Next, we analyzed “candidate genes,” i.e., genes coding for enzymes expected to be involved in these traits. These analyses involved cloning and sequencing such genes, searching for genetic variants, developing assays for such variants, and testing for their association with traits. Examples of genes we analyzed were those encoding growth hormone, the growth hormone and

prolactin receptors, ornithine decarboxylase, and more (Praslickova et al., 2008).

The chicken genome had already been sequenced, and using this technology, we would be able to conduct comparisons of entire genomes. However, at the time, the technology was out of the reach of a small laboratory.

A trait of particular interest to the poultry breeder is resistance to Marek's disease, a highly contagious viral disease that usually requires the eradication of the entire contaminated flock. The virus proliferates in feather tips, and the course of infection can be quantitated and followed in extracts of feather pulp (Kuhnlein et al., 2006). An analysis of 499 commercial White Leghorn chickens revealed three independent markers in the vitamin D receptor gene associated with Marek's disease resistance (Praslickova et al., 2008)

KUHNLEIN, U., J. L. SPENCER, M. CHAN, D. PRASLICKOVA, K. LINHER, A. KULENKAMP, and G. ANSAH. *Relationship between Marek's disease and the time course of viral genome proliferation infection in feather tips*. Avian Diseases, 2006. 50(2): p. 173-178.

PRASLICKOVA, D., S. SHARIF, A. SARSON, M. F. ABDUL-CAREEM, D. ZADWORNYY, A. KULENKAMP, G. ANSAH, and U. KUHNLEIN. *Association of a marker in the vitamin D receptor gene with Marek's disease resistance in poultry*, 2008. Poultry Science, 87 (6): p. 1112-1119.

When associating markers in a particular gene with a trait, one has to consider that genes may be part of a complex network of interacting genes. Hence, the effect of a particular mutation may differ among the many chicken strains. We showed such effects between genotypes of phosphoenolpyruvate carboxykinase (a mitochondrial genetic marker), growth hormone, growth hormone receptor, ornithine decarboxylase, and insulin-like growth factor-1. Among non-inbred White Leghorn strains, we identified 14 genotypes in linkage disequilibrium.

KUHNLEIN, U., R. PARSANEJAD, D. ZADWORNYY, and S. E. AGGREY. *The dynamics of the genotype-phenotype interaction*. Poultry Science, 2003, 82 (6): p. 876-881.

DNA Fingerprinting in Poultry and Other Species

To conduct a meaningful analysis of the associations of genetic variants with traits, we had to know the degree of inbreeding in the strains under analysis. To that end, we developed the methodology of “DNA fingerprinting,” a method based on measuring the distribution of the short semistable repetitive DNA sequences present throughout the genome of most higher organisms. The number of repeats varies slightly from generation to generation. By digesting the DNA with a restriction enzyme (which cuts the DNA at specific sites), we can separate the DNA fragments by length and visualize them using hybridization with the repetitive sequence. This results in a series of bars on the electrophoretic gel, where the length varies by the number of repetitive sequences it contains. That is the DNA fingerprint.

Since the number of repeats is fairly stable, siblings have identical DNA fingerprints, while unrelated individuals have quite different fingerprints. Similarly, individuals from completely inbred strains have identical DNA fingerprints, while individuals from noninbred strains show variations. We then used this methodology to develop a calibration curve for inbreeding in White Leghorn chickens.

KUHNLEIN U., D. ZADWORNÝ, Y. DAWÉ, R.W. FAIRFULL, and J.S. GAVORA. *Assessment of inbreeding by DNA fingerprinting - development of a calibration curve using defined strains of chickens*. *Genetics*, 1990. 125 (1): p. 161-165.

One can use DNA fingerprinting to study inbreeding in chickens and the genetic relationship of individuals in other bird species and other animals. Negro et al. (1996) documented the low incidence of extra-pair fertilization in the lesser kestrel. Perreault et al. (1997) measured patterns and correlates of American redstarts.

NEGRO, J.J., M. VILLARROEL, J.L. TELLA, U. KUHNLEIN, F. HIRALDO, J.A. DONAZAR and D.M. BIRD. *DNA fingerprinting revealed low incidence of extra-pair paternity fertilizations in the lesser kestrels*. *Animal Behaviour* 1996, 51: p. 935-943.

PERREAULT, S., R.E. LEMON and U. KUHNLEIN. *Patterns and correlates of extra-pair paternity in American redstarts (setopage ruticilla)*. *Behavioral Ecology* 1997.

Ciro Rico did his Ph.D. studies with G.J. Fitzgerald at the University of Guelph and my laboratory on the mating behavior of stickleback fish. He analyzed the genetics of the ornate stickleback fish, whose males build nests with bubbles and entice females to lay eggs, which the nest-builder quickly fertilizes. Other males, called “sneakers,” search for nests that already contain eggs they quickly fertilize before the nest-builder has the opportunity to do so (Rico et al., 1991)

RICO, C., U. KUHNLEIN, and G.J. FITZGERALD. *Spawning patterns in the 3-spined stickleback (Gasterosteus aculeatus L.): an evaluation by DNA fingerprinting*. Journal of Fish Biology, 1991, 39: p. 151–158.

Urbani et al. (1998), who demonstrated sperm competition and paternity assurance during the first breeding period of the female snow crab, also used DNA fingerprinting.

URBANI, N., B. SAINTE-MARIE, J.M. SEVIGNY, D. ZADWORNÝ, and U. KUHNLEIN. *Sperm competition and paternity assurance during the first breeding period of the female snow crab (Chionoecetes opilio (Brachyura: Majidae))*. Canadian Journal of Fisheries and Aquatic Sciences, 1998, 55(5): p. 114–1113.

Nicola Urbani



Dr. Nicola Urbani, 2023.

Nicola Urbani was quite a character, and he hit it off pretty well with Peter, who was in high school then. I remember the two of them working on tying various marine knots and just having fun together. One summer, Peter was looking for some work, and Nicola taught him the process of extracting DNA, DNA sequencing, and other techniques. Sometimes, they’d play soccer together. Peter really liked him.

I have one strong memory of Nicola playing a joke on us in the copy room. There was a hole puncher for people to use before putting their documents in binders. Nicola would move the holes, so when I’d punch my manuscript, it wouldn’t fit in my folder. I’d yell, “Damn Nicola!”

Because of his pranks, other students in the lab were always trying to play jokes on Nicola. They'd put water on his chair, but he always figured it out beforehand. They'd be giggling and could not keep a secret, so he'd catch on. He added fun to the lab, which was always full of laughter. Our doors were always open, while other labs were so serious with their closed doors.

Here is Nicola's account of his time with me:

When I started at McGill, I was active in wildlife biology. I'd always been fascinated by life and was saddened by what humans were doing to nature, so I made that my field. Then, I had to figure out what to do with my degree. I was also interested in science, particularly genetics and molecular biology. At the time, a postdoc in Urs' lab, Ciro Rico, was working on genetics. And he told me I should meet Urs.

An opportunity arose to work with chickens in Urs' lab, identifying genetic variants associated with disease resistance or susceptibility. That's how I ended up doing my master's with him. I enjoyed working with him so much I wanted to continue. He was my mentor and father figure for a long time. I came from Europe to study in Canada, so I was on my own at McGill. I was socially awkward, and Urs was my anchor. He helped me realize I was smart and capable; I always appreciated Urs's mentoring.

Urs was also interested in genetics and wildlife. Many students were working in his lab with various animals, mostly birds. He collaborated with several other departments. This provided me with an opportunity to combine the techniques I'd learned and figure out other things in terms of natural resources. He knew I was interested in wildlife. That's how we came to work with snow crabs. I was so excited when Urs told me I could leave chickens and study snow crabs. He had secured some funding to study population genetics on snow crabs, which is how my Ph. D. work started.

The funding came from NSERC in collaboration with Fisheries and Oceans at the Maurice Lamontagne Institute. As is often the case in science, you start with one project which morphs into something else. You end up with a different project, but it still has value. Urs' training was very important to me, both in the lab and regarding the genetic theory.

We established the first-ever snow crab genomic library. We were looking at genetic markers that would allow us to study the population structure of the

wild snow crab. Many fishery resources were already gone in eastern Canada and the United States; cod, lobster, and shrimp were all disappearing. The one thing left was the snow crab. So, the government became interested in knowing how vulnerable this population would be to overfishing, which is why they funded the project.

Our task was to develop genetic markers and follow those populations to predict which populations would be more vulnerable or resistant to the fishing pressure. The idea is that, when you have a population with a lot of inbreeding, it becomes more vulnerable than one with such outbreeding. So, 2 or 3 years into the project, we'd identified excellent microsatellite markers that were extremely variable (many alleles). The idea was to use them for population genetics.

At this point, Urs and I had many debates on what to do next. Should we continue population genetics or try something else of keen interest to Fisheries and Oceans? They saw the vast variability of genetic markers as a tool to understand how the snow crab reproduced, something nobody understood. It's a very long cycle; it takes about 10–15 years for crabs to mature enough to reproduce.

Our original project (population genetics) morphed into snow-crab reproduction and its genetic components. Fisheries and Oceans were very happy about it. In fact, the people at Maurice Lamontagne enjoyed our work with them and continued to publish our work for 10 years, even after we left the field. We were the first in the world to do that – and it was really fun.

There was a lot of ego in that faculty. There's usually a lot of ego in any faculty. And one of the defining features of Urs' lab was the thrill of discovery. It was always about finding out about life and having fun doing great work. It was a unique environment because he couldn't have cared less about ego. "Let's just do good, fun work" was the lab's theme. That resonated with me. I think it's also why I enjoyed playing tricks on people. So many had big egos and took themselves way too seriously.

In science, most experiments fail. Trying and re-trying until it does work can be very frustrating – until you find a mindset or philosophy of experimenting for the sake of the experiment and not expecting a result. Then, you're pleasantly surprised when it does work. That patience, that mindset is what Urs taught me. And that is true about life, too, not just lab work. I learned resilience from working with Urs.

I will always fondly remember my time with Urs, his rigor and passion for questioning things and finding more questions than answers. And though I'm in a different field now, that rigor and passion have stayed with me. I got that from him.

David Zadworny

Dr. David Zadworny joined our molecular genetics efforts in the Department of Animal Science at McGill University after earning his Ph.D. at the Department of Animal Science at the University of Guelph. Although we each had our own lab, we shared the space. We loved to talk about science. He would do his work, and I would do mine, but, really, the students did the work, much like I had done under Werner Arber. My role was to help them with ideas and to raise the funding.

We collaborated on our research projects. David's main focus was bovine genetics. He and his students first analyzed the growth hormone gene in semen samples from 128 bulls used for artificial insemination between 1950 and 1987. They amplified and analyzed seven fragments covering almost the entire length of the growth hormone gene for single-strand conformational polymorphisms. This revealed the presence of six polymorphisms in the bovine gene. The breeding values for milk yield, fat content, and protein content for the Holstein bulls provided by the Canadian Holstein Association revealed significant differences between two growth hormone genotypes (Yao et al., 1996). This publication was among the most cited papers in my career.



Professor David Zadworny, 2008.

YAO, J.B., S.E. AGGREY, D. ZADWORN, J.F. HAYES, and U. KUHNLEIN. *Sequence variations in the bovine growth hormone gene characterized by single-strand conformation polymorphism (SSCP) analysis and their association with milk production traits in Holsteins.* Genetics, 1996. 144(4): p. 1809-1816.

We also analyzed the growth hormone receptor gene in the same data set for mutations near the 5'-end of the gene. We detected three restricted fragment

length polymorphisms, resulting in five genotypes. The genotypes of one of the markers were significantly associated with milk protein and protein content in the female offspring of these bulls (Aggrey et al., 1999).

AGGREY, S.E., J. YAO, M.P. SABOUR, C.Y. LIN, D. ZADWORNÝ, J.F. HAYES, and U. KUHN-LEIN. *Markers within the regulatory region of the growth hormone receptor gene and their association with milk-related traits in Holsteins*. Journal of Heredity, 1999. 90(1): p. 148-151.

I remember many conversations that started with Zad offering me a cigarette. I guess smoking was a catalyst for our friendship – a private moment – to get us out of the lab.

Here is what David has to say about our time together:

I had heard about a scientist at McGill who was building a “super chicken.” This was quite a new field, 4 or 5 years before the first genomic transfer of growth hormones in mice. So, I sent Urs my CV. In early 1986, he telephoned to interview me for a postdoc. Unfortunately, I had just accepted a position in Japan. We maintained contact, however, and when I returned from Japan, he asked me to come down for an interview.

I remember seeing newspaper and tabloid stories with photos of Urs holding a chicken, the headlines reading something like “Scientist Will Clone Super Chicken to Save the World.” I thought this was fascinating, so I drove from Toronto to the Macdonald campus, and we sat in his office talking for a few hours. He was like a sailor; he speaks very calmly, and he is very easy to talk to and listen to.

Urs was quite busy when I joined the lab in 1987 as a postdoc. He was working with Jan Gavora on endogenous viral elements. He was also working with AT and XP, and he had a technician, Barbara Waters, who worked with bovine placentas to extract and purify those two enzymes. Lenny Volkov was a lab assistant. She was with him from the very beginning. We shared the lab with Jeff Turner, an Assistant Professor, and Jagody Butch. Butch was working for the Quebec government on dairy cows through a structural grant, and Urs was supervising that project. Our lab was always very busy.

Urs first came to McGill in the early years of molecular biology. Subsequently, several people were hired who were interested in that field but in different

departments. Urs made a concentrated effort to organize all these individuals – one from plant science, one from parasitology, one from microbiology, and two of us from animal science – into one new department. I recall that we had many discussions about this over cigarettes and coffee.

He argued very strongly about this to the dean, Roger Buckland, and explained how useful it would be for recruiting and for the researchers themselves to be able to better communicate. However, the dean and the department heads were against it because Urs successfully attracted funding; if we were to leave our departments, the money would follow us. We'd be much more effective in recruiting better-quality students. We'd be much more effective in sharing our space and ideas. But we'd be taking money away from our respective departments. So, the idea never came to fruition, although the campaign did continue for several years.

There are literally thousands of stories about Urs and from Urs himself. He always told us stories from his past or present, whatever fit the work circumstances. One example is the conclave. We'd have an annual departmental meeting where all we would discuss during the entire meeting was bureaucratic matters, such as weighted student units or how to attract more students and more funding. Urs would sit there and tell us about his conclaves from his time in California, where he and some other scientists would walk along the beach and simply talk about science. Such anecdotes came up all the time. Sometimes, he'd casually slip in surprising facts or say things like, "Oh, I used to work with Lämmli." It was phenomenal. Or about his work with Werner Arber. It was truly amazing, and he was quite humble about it.

Over the years, we had a lot of fun. Lenny was always bringing in food, most of it inedible. But I will say this: Urs could have a very strong temper, and on occasion, he'd blow up in the lab – and usually it was over a lack of food.

I remember that both Peter and Letitia worked in my lab, too. Letitia was there for 4 or 5 months, working in plant science at the time but doing work for me. I think this was during a break between her Master's and Ph. D. Peter, too, worked in my lab, and I can say both were hard workers and did not take advantage of their status. I remember having some computer trouble once, and when the IT guys came to look, they discovered Doom, the video game, had been hidden under the platform. Whenever we couldn't find Peter in the lab, we knew to look in my office. There he'd be, playing Doom.

Peter and Urs were kind enough to take me climbing one time. They picked me up, and we headed for Mont Rigaud. It was my first time climbing. Peter went up first to set all the pitons. Then I started, and every time I had to put my knee on a rock, I'd brush off all the loose rock first, which sent it raining down on Urs and Peter. They kept screaming up to me to stop sending loose rock down. I had no skill whatsoever. Needless to say, they never invited me to climb again. I think the most fitting description of Urs is that he's a Renaissance man. One time, I drove with him from Paris to St. Brieuc for a conference, and during the entire car ride, he talked about art, history, and music. He knows a lot about many things and is grounded in so much knowledge. In addition to being passionate and serious about everything scientific and logical thinking, he has other passions: music and history. This came up over and over. For example, when we visited Dr. Smiley from the European branch of Shaver, who had built a harpsichord, there was a long discussion about how this was done, sending Urs off to figure out the mathematics behind the tuning. Interesting things like this were always happening.

We talked about everything. Urs was instrumental in developing DNA fingerprinting and had published several papers on the subject. We attended an international conference in Bern, Switzerland, organized by Alec Jeffreys. Urs gave a major presentation – this was early on in the field – and most speakers didn't have any hard proof. Urs' paper was the only one to specifically show that inbreeding could be calculated based on the sharing of DNA fingerprints. That was a very useful application of the methodology, above and beyond simply showing paternity.

People at the conference raved about the quality of Urs' work. He applied the methodology to have practical usage, and that was always the thing with Urs. Many people observe a new breakthrough in science and then immediately apply that, say, to a horse or a cow or a hamster, but do nothing practical with the technique other than to prove it can be done in another species. But with Urs, it was more: He was always looking to see whether the work would inform him of something new he didn't know. I think that's how he worked throughout his whole career – looking for something beyond the application of the technique. He wanted to use the methodology to further advance the field, to look for a deeper meaning.

Vacations

Our travels spoiled us in life. The way we traveled always involved getting to know the local culture. What captured us throughout all our travels was the wildlife and the ethnography – seeing something interesting or beautiful, some unique scenery or wildlife, and then getting to know the local people and their food. Many of our trips centered around Harriet’s career, which was Indigenous Peoples and social justice, and I would tag along as part of that story. I always felt everyone was nice to me because of their affection for Harriet.

Here are a few notes about some of our memorable trips.

In 1990, Harriet, Peter, and I took a trip to Kenya, where we rented a car and went off to explore. No guide. No tour group. No GPS. No cell phones. Just the three of us in a Jeep. Friends from Harriet’s work hosted us as a sort of base camp.

The Masai Mara National Reserve is where Peter learned to drive. But one time, when I was driving, I remember we wanted to get closer to a herd of elephants. Peter was standing in the back with Harriet through the sunroof with his camera, clicking away. We drove past the elephants, and Peter told me to stop the car. He started taking photos, and they kept coming closer, flapping their ears, kicking up dust, clearly aggravated. Peter was yelling, “Go, Dad, go!” I had accidentally put it in reverse and was heading directly toward the elephants. That caused quite a panic in Peter. Another close encounter occurred in the park near Nairobi, when we came around a corner, and suddenly a giraffe looked down on us through the sunroof.



Driving in the Masai Mara National Reserve, Kenya, 1990.



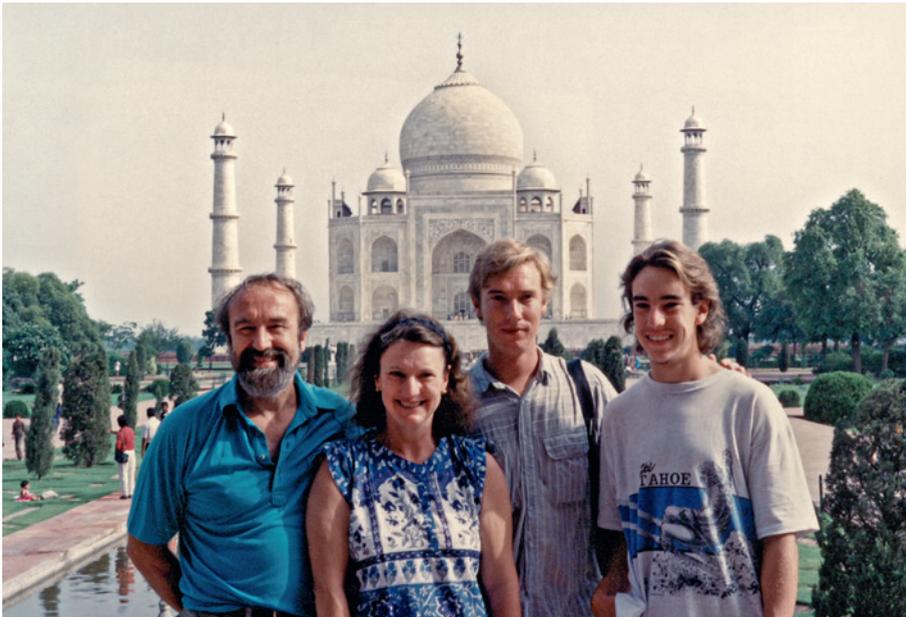
We got too close to a large bull elephant, 1990.

In Tanzania, our car got stuck in the mud because the road was blocked, and we were trying to bypass it on a side trail. Eventually, a local young man – a teacher – rode by on a bicycle, and after some struggles with translation, he went to the nearest village for help. The next thing we knew, several strong villagers arrived to help us lift the car out and carry it back to the road.

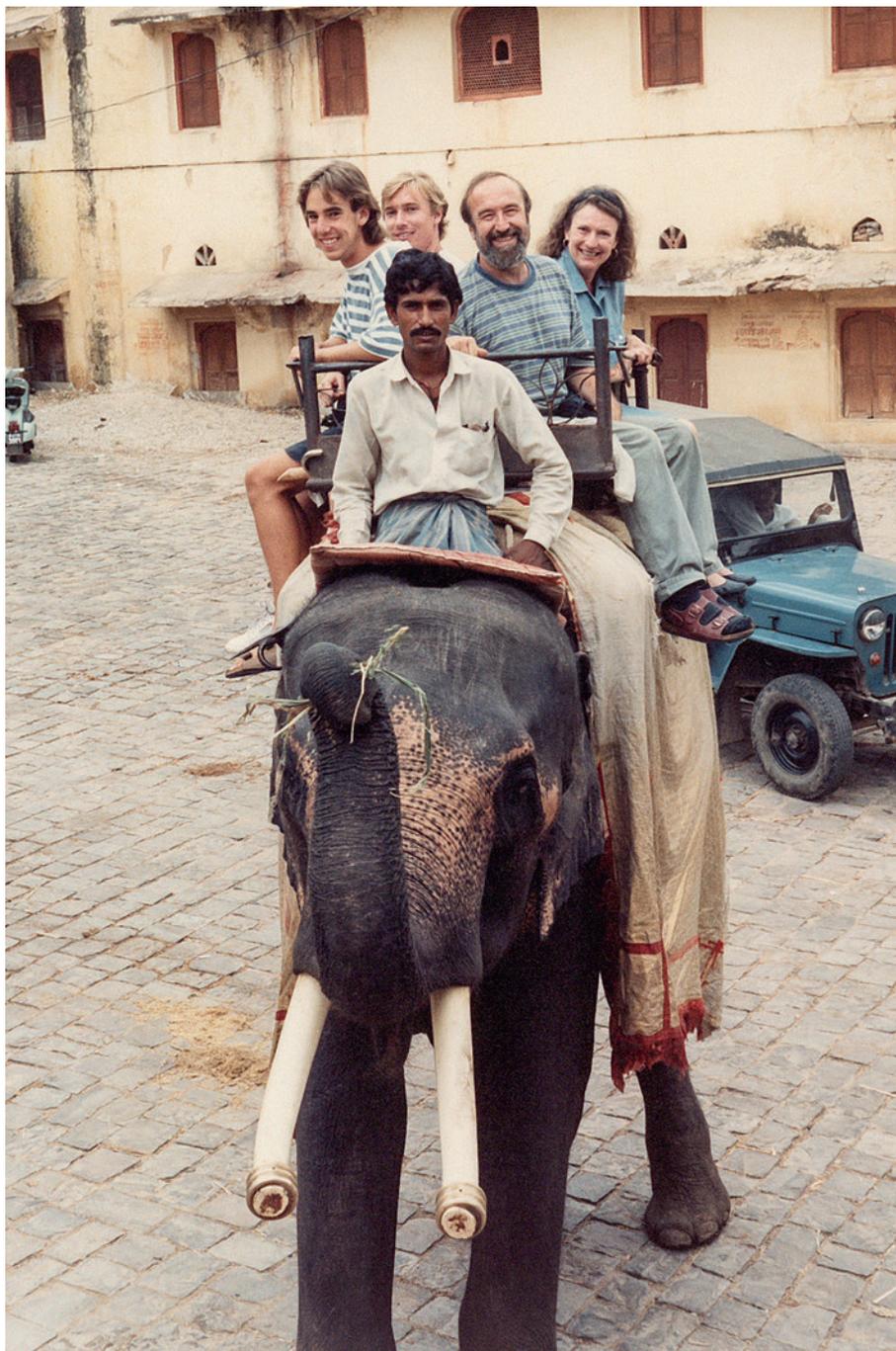
Sometimes, Peter and Harriet would accompany me on trips when I had to give lectures or attend conferences. On this African trip, I had a meeting during a layover in Edinburgh, so Peter and Harriet went exploring while I attended the dinner reception. I'll never forget that, instead of bottled water, they had placed bottles of Scotch on the tables.

* * *

One memorable trip was when Peter, Matthew, and I visited Jaipur, the Taj Mahal, and then continued to Kathmandu. The bus ride to the village (base camp) was the stereotypical, winding, narrow dirt road on a steep, sloped mountainside. Matthew and Peter were on the top of the bus having



Visiting the Taj Mahal in India, 1991. From left: Urs, Harriet, Matt, and Peter.



In Kathmandu, Nepal, 1991. *From left: Peter, Matt, Urs, and Harriet.*

the time of their lives. The driver was having trouble with the gas, and I remember he had a can of diesel that he had to start transferring by siphoning with his mouth. He had a lit cigarette in one hand and was driving along pumping the gas with his other hand. We eventually came to a washout and had to walk the rest of the way to where we would start the climb.

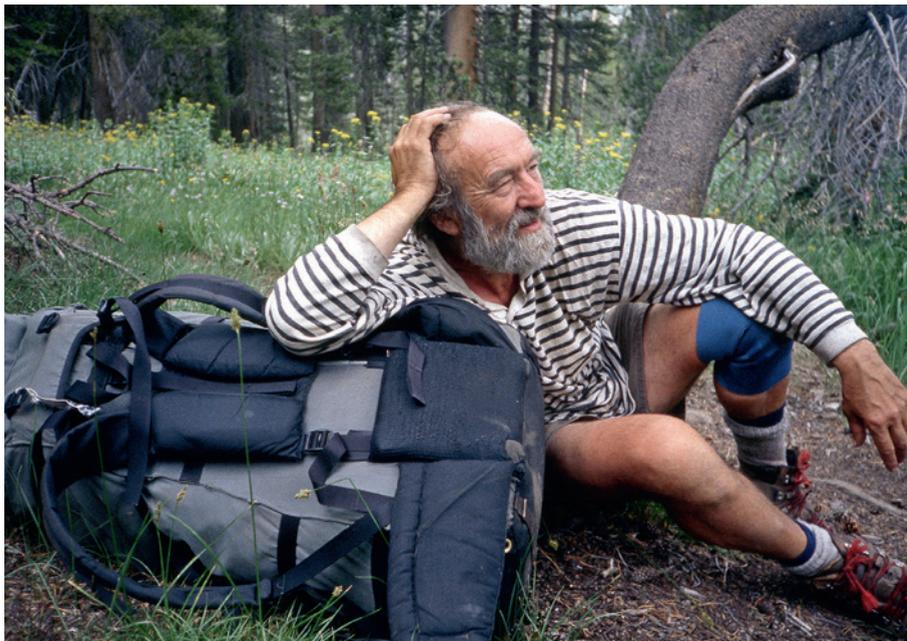
This trip was special for Matthew because, at the top of the climb, lay Gosaikunda Lake (15,000 ft), the purest holy lake in India. According to Hindu mythology (Samudra Manthan legend), the lake of Gosaikunda was created when Lord Shiva thrust his Trishal (holy trident) into the mountain to create cool water to soothe his throat from the poison released into the world. Dipping in this holy lake is thought to get one as close as possible to divinity. We happened to be trekking during the festival Jania Purnima, when thousands of Hindu pilgrims climb to bathe in the holy water. I remember how the grandsons carried their grandmothers on their backs. One man was even carrying an older woman strapped to a chair on his back. Matthew was keen on bathing in the lake to be absolved of his past sins, so he took the dip.

It took us 2 days to get up to the lake; along the way were huts where vendors sold tea. We had a private guide and one sherpa, who carried some of our things, though we took most of it. We were very impressed with our young sherpa: Here, we were equipped with high-quality hiking boots and backpacks, whereas he was in flip-flops, going much faster than we were. Nor did he use the backpack straps but instead wore a strap on his forehead to carry the packs.

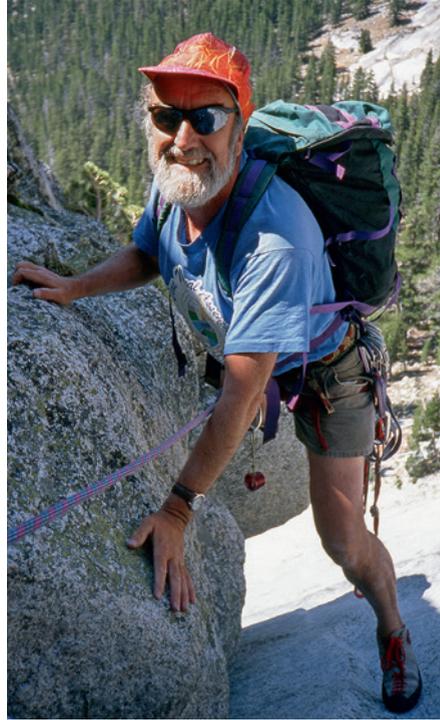
We stayed in a hut the first night, and there were no sanitation facilities. You didn't dare go out in the dark for fear of stepping in waste. The smell was quite strong - in addition to the strong smell of the betel nut the locals spit out.

* * *

Peter and I always planned a summer road trip. One of our first was to the Grand Tetons and the second was to the Bugaboos in the Canadian Cascades. These were formative years for Peter. Another formative trip was hiking the John Muir Trail in Yosemite. I cracked my knee from overuse when Peter and I were right in the middle of the trail (14 days in). The only way down



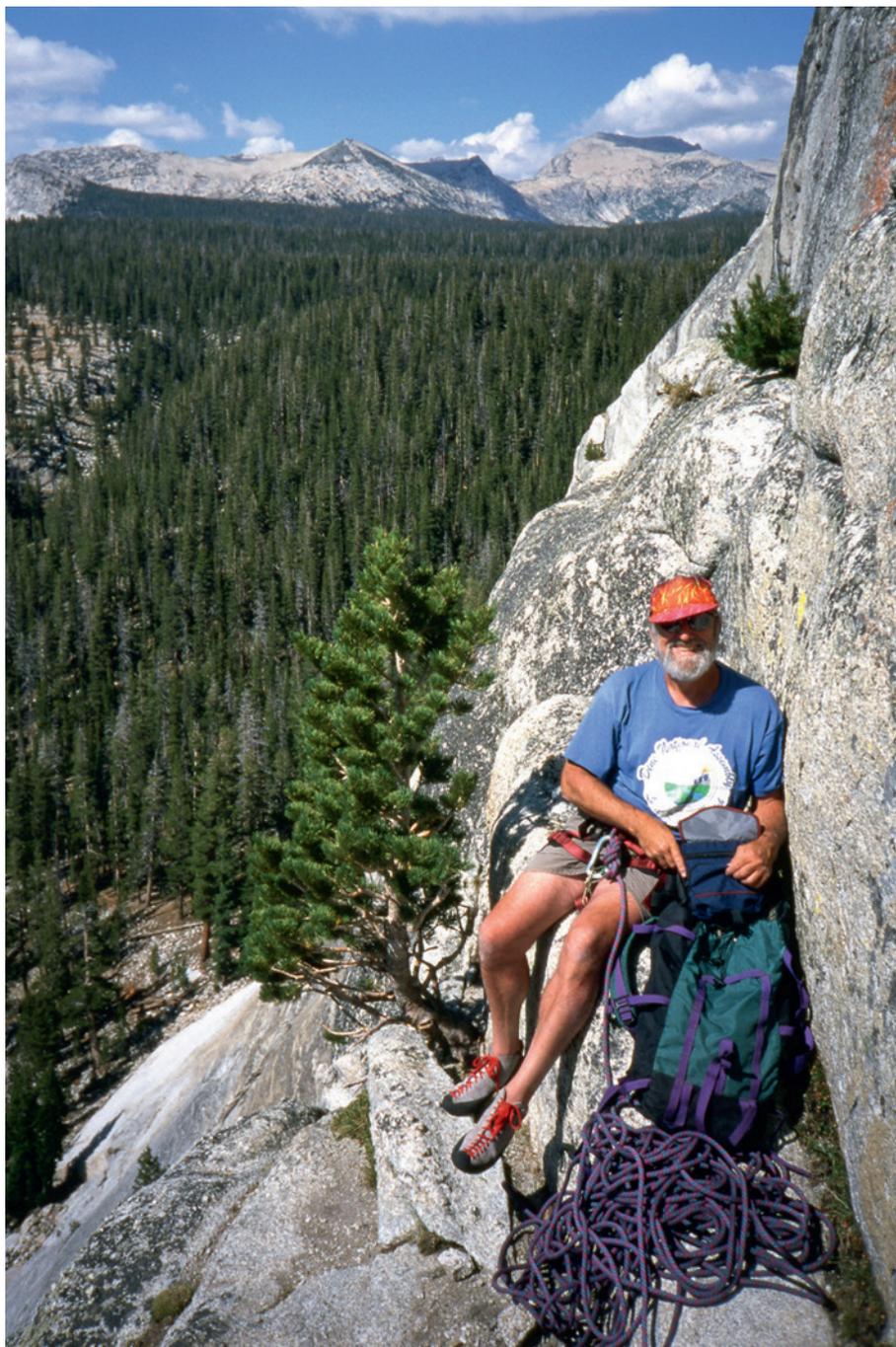
Resting on the John Muir Trail, Sierras, California, Part 1, 1997.



Cathedral Peak in Tuolumne Meadows area of Yosemite National Park, California.

was via the Taboose Pass, a 5,000-foot descent. We knew we needed to turn around, so we headed down this random path to the trailhead, hoping to find a car or someone to help. We eventually did return to finish the trail. During this trip, I felt the security of Peter's alpine knowledge and skills. It felt so safe climbing with someone I knew I could trust.

One funny memory stems from our climb up Cathedral Peak. At the time, I had started to lose my hearing. Peter yelled something down at me as we climbed, but I couldn't hear him well. On the way up, there was a protection piece of Peter's, a very stubborn piece, and I kept working to get it loose. Peter kept yelling down, and finally we figured out he'd been telling me to leave it; it wasn't his equipment. This trip stirred many memories of climbing with Harriet and Matthew, with 3-month-old Peter in my backpack. And now, he was the one leading me!



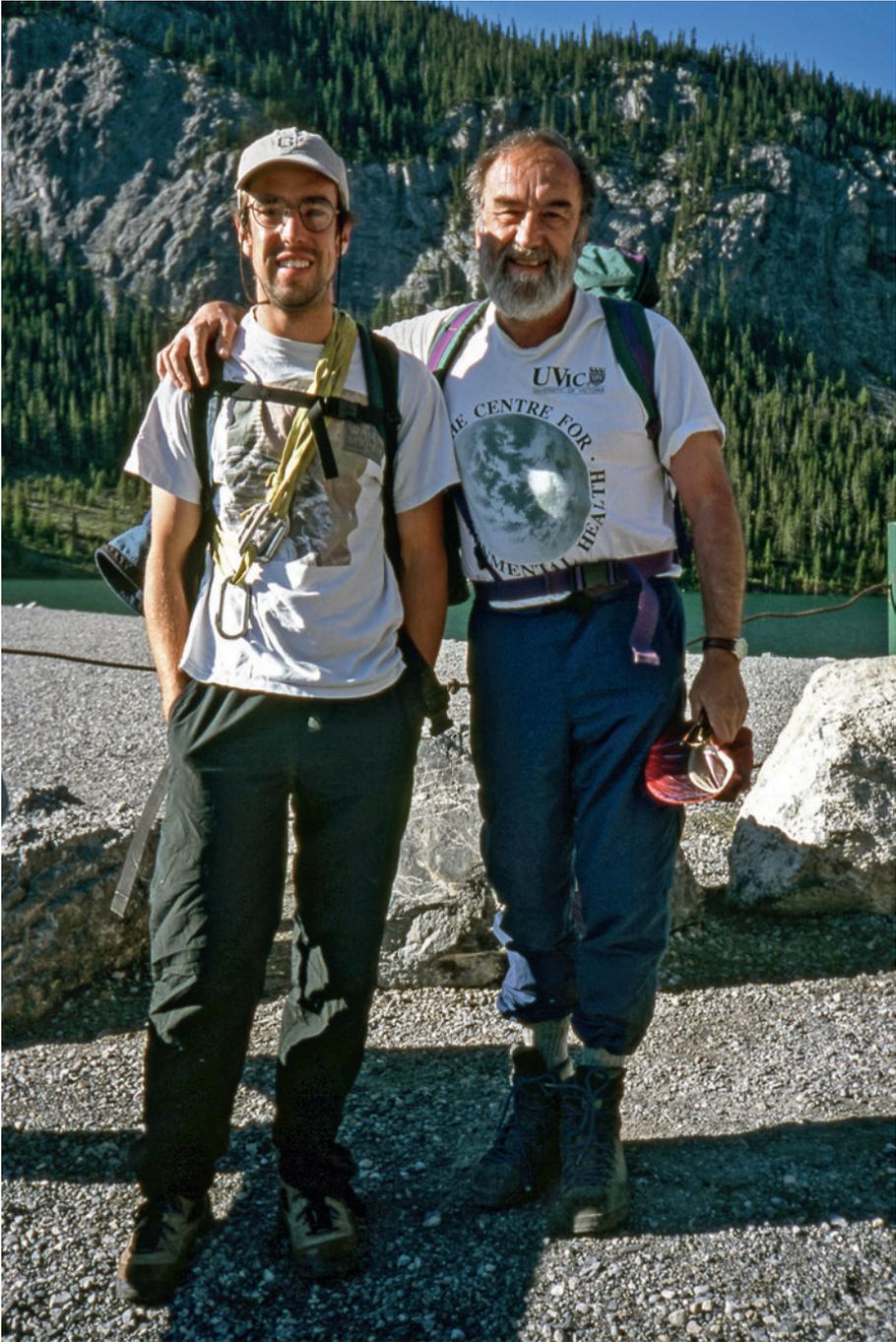
Urs on Cathedral Peak, 2000.



Urs on Ha Ling Peak, 2000.

Peter and Harriet say I'm not a precise planner. On more than one occasion, I had miscalculated – or failed to calculate – the timing for both ascent and descent. A few other times, I forgot to pack our lunch. This led to frustration on their part every so often. For example, we were at Matthes Crest on this same Cathedral Peak climb, and Peter got very mad at me. First of all, we were late because, he said, we were too slow. Second, we were rappelling from this one piton, and according to Peter, I was somewhat dehydrated, which made me quite giddy. So I bounced around to prove it was safe, telling him everything was fine. He was so scared and mad. He kept yelling, “Stop it, Dad!”

That same year, we visited Peter in the summer in Canmore, Alberta, where he had worked as a ski guide. Peter took me on a very well-established route up Ha Ling Peak. At one point, I was hanging on this overhanging section, and Peter yelled at me, “Dad, stop right there! Hold on, I want to take a photo!” And he just left me hanging there, swinging my legs, waiting for him to get his camera equipment ready. Back in town, Harriet had some friends visiting, and they got so scared looking at us through binoculars. Harriet decided she wouldn't just sit and wait for us, so she rented a helicopter to



Urs and Peter, near Ha Ling Peak, Alberta, Canada, 2000.

enjoy the view we were working so hard to get to. We were slightly disdainful because we thought she had cheated.

Something memorable always happened on our trips. When it wasn't bad timing or overhanging cliffs, it was animal encounters. I remember one boat trip on Lake Chelan (Washington State). We got out to have lunch on a bank. Nearby was a very loud, rushing creek, and Peter, who was about 5 at the time, was sitting on a tree trunk. I looked over, and about 3 feet away was a furiously rattling rattlesnake we hadn't heard because of the roaring creek. I quickly got up, grabbed Peter, and ran away.

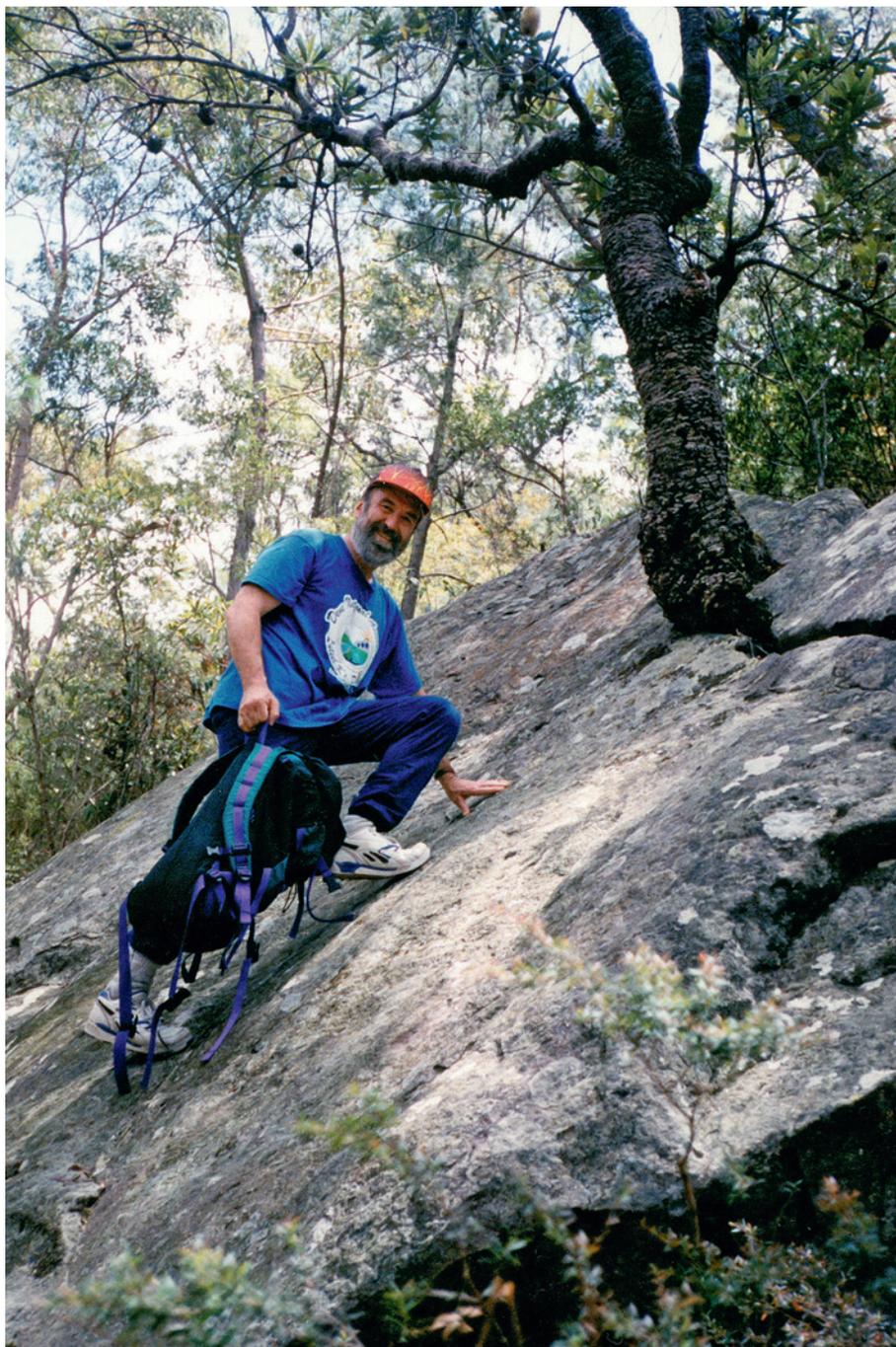
* * *

In 1995, I was in Australia studying in a poultry lab, and I remember taking a break and walking 5 days straight all alone - by choice. It was such beautiful terrain, and I didn't see a single soul. But Harriet did worry about me.

* * *

Our entire 1998 trip to Peru was worthwhile on all counts. Peter, Harriet, and I rode a bus to the crest of the Andes. Harriet stayed on the bus and went back down, while Peter and I biked from the top all the way down to the Amazon River. The following day, we all canoed down the Amazon. Peter and Harriet decided to take a separate excursion to see the macaws, but I chose not to go. This was an adventure for Harriet because, one night, she had to leave her tent to use the latrine. Their tent was one of those covered platforms raised on stilts. The latrine was just a short walk away, and several candles were burning in it. Harriet happened to look up and saw a great big green cylinder slithering across the ledge: a python! Fortunately, she had the capacity to go into a deep calm and waited patiently and quietly for the snake to leave. What a night!

Harriet and Peter were in Peru one other time for Harriet's research. She was working with the Indigenous Awajún people of the Amazon frontier. This was in the middle of the jungle, with no roads for public transportation.



Urs on a hike in Australia, 1995.



Urs flying down the Peruvian Andes on a bike, 1998.

They had to take a boat to get to the village. Everyone there was very friendly, including the head of the village, who wanted to give Peter a wife.

Peter politely declined, explaining he already had a girlfriend, but the insistent chief told Peter he could take his new Awajun wife home and have two women. When Peter again explained that Lisa probably wouldn't go for this idea, as generous as it was, the chief said, "We'll throw in a canoe!" Such hospitality.

* * *

The year 2001 was quite full of traveling, as Harriet was on sabbatical leave in Rome and Bangkok and was able to conduct case studies on the foods, nutrition, and health status of the Indigenous communities in China (Miao), Thailand (Karen), India (Bhil and Dalit), and Bangladesh (Mogh and Nayakrishi farmers). I visited Harriet in Rome, which gave me a glimpse of the FAO efforts dealing with genetic diversity in wild species as well as in domesticated plants and animals. We went hiking in the Abbruzzi Mountain



Urs canoeing on the Amazon River in Peru, 1998.

National Park and traveled to Reiti, where we learned a lot about the art of cooking pasta “the Italian way.” Before, I had never given it much thought, besides having the water boil before throwing in the spaghetti. We also had a marvelous week with Matthew, Tanya, and friends from Portland in a villa in the middle of Tuscany, gorging ourselves on olive oil, cheese, and prosciutto, washed down with copious amounts of great Chianti.

In the fall of 2001, we started our Far East trip to Bangkok. Peter, Lisa, and I flew in from the United States and Canada, while Harriet flew in from Europe after attending a conference in Bratislava, a nutrition conference in Vienna, and a trip to Prague. Our first journey out of Bangkok took us West to a village of the Karen people near the border of Burma. Dr. Suttalak Smitasiri and her team from the Institute of Nutrition at Mahidol University had organized it. What a marvelous team – each of them – and what hospitality in the Karen village! The next trip was to India to visit a Bhil village north of Mumbai (formerly Bombay) with Dr. Gopa. Beautiful! Then, we went to Hyderabad to visit Salome and Dr. Satheesh and their project. We stayed for several days in the central research station. Without TV and radio, singing and talking were our main entertainment. What an experience India was; we were always glad to leave the hustle and bustle of big cities with their traffic jams and pollution and be with these rural people.

After a short stay in Bangkok, we flew on to Chengdu in China, where we were royally received by Dr. Li Dan, Dr. Wu, and their team. The meal was over the top and so memorable. They had ice sculptures and went out of their way to provide their “international visitors” with a good experience. It was a little embarrassing because we were unaware of the cultural expectations around eating and seating arrangements and where each person was expected to sit. At the end of the meal, we became the entertainment: They asked us to sing. Peter and Lisa sang “The Wheels on the Bus,” Harriet sang the cowboy song “Don’t Fence Me In,” and I sang a Swiss Christmas carol. They had also hired an attendant whose sole purpose was to look after us. We made a big game of that, trying to escape and sneak away. Peter, Lisa, and I would just disappear, and Harriet would be left stuck with the attendant.

From Chengdu, we took a 10-hour ride to the town of Gong, from where we had another 4-hour ride into the mountains of the Miao village. We spent a day there interviewing and collecting samples. A superb meal prepared by the village people and a dance performance brought a remarkable day to a close. We spent additional days visiting the Sea of Bamboo in Juizhaigou, north of Chengdu toward the Tibetan plateau, and the magical countryside of Guilin and the Li River.

We were in Southern Thailand when the terrorist attack of 9/11 occurred. We couldn't believe what we were watching on TV. Peter and Lisa returned home, and we went on to Bangladesh. We rode a bus through all the demonstrations in the city on the way to our fieldsite. It was night, and the curtains on the bus were open, but as we looked out the window, we saw all these anti-American signs and posters and quickly closed the curtains. Our site was far out in the countryside without electricity, and the villagers had no idea what had recently happened in the United States.

Nevertheless, Harriet's research continued, and I took this opportunity to collect DNA samples from the village Naked Neck chickens, perhaps the last chance, I thought at the time, before those ancient and well-adapted chickens got swamped by cross-breeding programs with imports, thereby erasing the history of the evolution of the domesticated chicken forever.

It Must Be Noted: Cats

We had so much fun over the years: travel, kids, grandchildren, grad students. And cats. We are cat people. I always had cats growing up, as did Harriet, and as a couple, we have always had cats, usually in pairs. All our grown children have cats as well. We thrive on their affection. When they come crying for something, it just melts our hearts.

In Eugene, Matthew had Frosty, and Letitia had Rebecca (a tabby female). In Vancouver, we got Hanna Banana, a gorgeous black cat, and one of her offspring, Inka, a beautiful calico. Inka disappeared while we were on vacation, but Hanna Banana made it to Quebec and was with us for several years as Peter's cat.

In Quebec, we were given Bootsy and Amber, then Jasper and Orien. Amber and Orien were outdoor cats and didn't last long, and Bootsy suffered a mortal midsection injury. So after they came and went pretty quickly, we had Jasper and then Meissa.

Harriet became interested in going to cat shows and was particularly taken by Maine Coons. She heard about a litter in Ontario, so she and Peter drove there from Quebec and ended up bringing home Meissa, the runt of the litter (Maine Coons can get very big), named for the bright star in the constellation Orion (though the name of the cat was Orien). She was just perfect in her coloration. Jasper was a bit of a bully, and after we brought Meissa home, Jasper grew fatter and fatter from eating Meissa's food.

In the end, though, Meissa the runt lasted the longest. She moved with us to Anacortes, and we had her for 24 years. After she died, we didn't have any



Hanna Banana, our cat in Vancouver and Quebec, 1986.



Frosty, Matthew's cat in Berkeley, California, 1974.



Jasper, our cat in Quebec, 1998.



Mister Butterscotch in Anacortes, 2023.



Meissa, our long-lived cat in Quebec, who moved with us to Anacortes, 2000.

more cats. Until COVID, when we got Prince Pierre and Mr. Butterscotch, our COVID kitties, from granddaughter Madelyn's second foster litter.

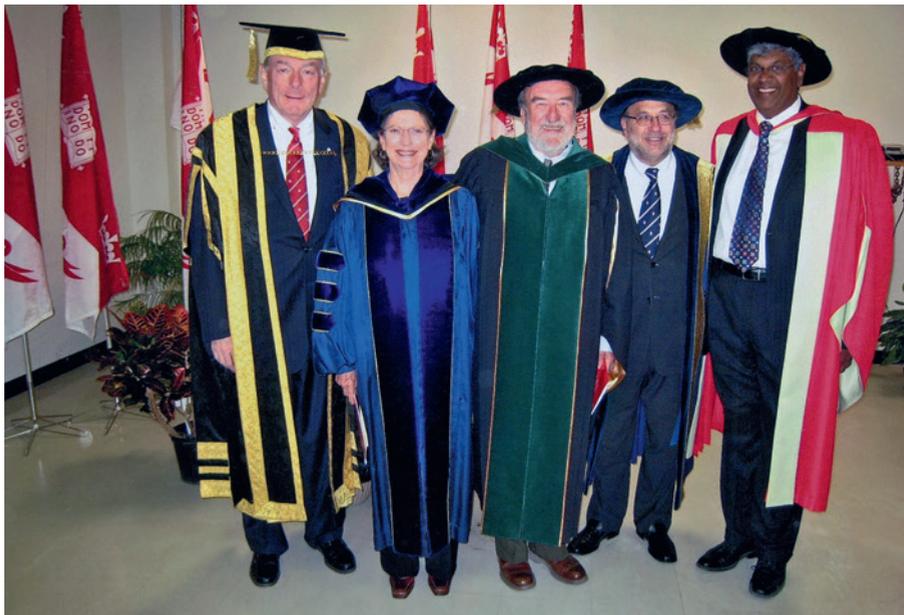
She has since fostered several litters. Prince Pierre turned out to be fiercely independent and never wanted to come in, which sadly led to his permanent disappearance. Mr. Butterscotch was the friendliest cat in the neighborhood and stayed with me when I would go on walks. Everyone knew him.

After McGill

Our Emeritus/Emerita citations (2008, 2009) signaled our retirement from McGill, and it was time to consider relocation. A lot of stars aligned to point us West. First, my last grant was running out, and it would have been quite an effort to reapply and try to get more funding. Shaver Poultry Breeding Farm had been sold to a Dutch company, so there was no longer a strong Canadian connection to breeding or annual seminars at which I could speak. Also, Agriculture Canada had left poultry breeding at the time, so it was an organic evolution to retire. When I retired in 2008, I was designated Professor Emeritus, as was Harriet in 2009. At the time, the university awarded only one Emeritus title per faculty at each ceremony, so Harriet and I received the last two in 2008 and 2009.

The very harsh winters were a second contributing factor. We weren't getting any younger, and we didn't have family around to help with our beautiful but large house, which was becoming a chore.

And, finally, the separation from family was on our minds. Peter's studies had taken a turn: He did a year in Canmore, Alberta, then attended and graduated from the Western Academy of Photography in Victoria, where he met his future wife, Lisa. When they decided to stay in Western Washington, we thought long and hard about returning West. Matthew and Letitia had both settled elsewhere (Oregon and Arizona). We had always loved the West coast - the mountains and the climbing had provided many wonderful memories, from Vancouver and Oregon. And we would be close to Canada, a country we had come to love.



Celebrating McGill Convocation and Emeritus Award, 2008.
From left: Chancellor Richard Pound, Harriet Kuhnlein, Urs Kuhnlein, Robert Rabinovitch,
Chair of McGill's Board of Governors, and Dean Chandra Madramootoo.



Our Anacortes home.

We initially decided to purchase a second home in Anacortes and keep the Montreal house, but it wasn't financially feasible. There was very little on the Anacortes housing market at the time. Peter and Lisa were trying to build their photography business. They had arrived in Anacortes in 2003 when Lisa was offered a job with a photography magazine.

One day, we got a call from Peter saying we wouldn't believe it, but the house across the street from them was for sale. We didn't hesitate. We bought it in 2008, and it took about 2 years to complete the renovations. Matthew did the design, but, first, he came in and tore everything apart. He took down the walls to the studs, replaced the windows, wiring, and plumbing, raised the ceiling, opened the kitchen and dining room, and so much more.

I was traveling back and forth to check on things, while Harriet was still working on her two book projects. Construction drug on, so, in 2009, I moved in with Peter and Lisa to supervise the work, which seemed to pick up after I arrived.

In the fall of 2010, we drove across the country, leaving our home of 25 years, and arrived in Anacortes the day before our granddaughter Madelyn was diagnosed with childhood leukemia. It was good that we could be there for Peter and Lisa. I was more retired than Harriet because she still had projects to complete.

One of the things I was most looking forward to was spending time in the mountains. Sometimes, I would go alone if I couldn't find anyone to accompany me. I also went skiing at Mt. Baker, and we continued to take trips and have traveling adventures.

Travels

One of my all-time favorite trips was to Galapagos. Like most of our travels, the wildlife and animals were a highlight for me. This was no different: The best part was snorkeling and swimming with the fish - until we snorkeled right into a sea of jellyfish. I was burning from all the stings. In the chaos and haste, I even lost one of my flippers. This particular trip was a National Geographic tour, and I remember the boat being very comfortable.



The iconic blue-footed boobie in Galapagos, 2013.



The giant Galapagos tortoise can live over 100 years and weigh up to 900 pounds, 2013.



We joined a tour in Burma/Myanmar by ship on the Irrawaddy River that stopped in several scenic and historical sights, 2014.

Urs ringing the gong before our hike to Tiger's Nest, 2014.





We encountered many seals that were unafraid of humans and often slept camouflaged among the rocks.



We also saw a lot while kayaking and being underwater using snorkeling gear.



In Bhutan, we had the required guide and personal driver for a tour, 2014.

We visited many sacred Buddhist sites in Bhutan, including the temple Paro Taktsang Palphug Monastery and the Tiger's Nest, 2014.





Urs in Thailand.



In Northern Thailand we visited a tribal school where girls wore rings to stretch their necks to become "beautiful."



Urs and Harriet enjoying Thailand, 2001.



Orchids in Thailand.

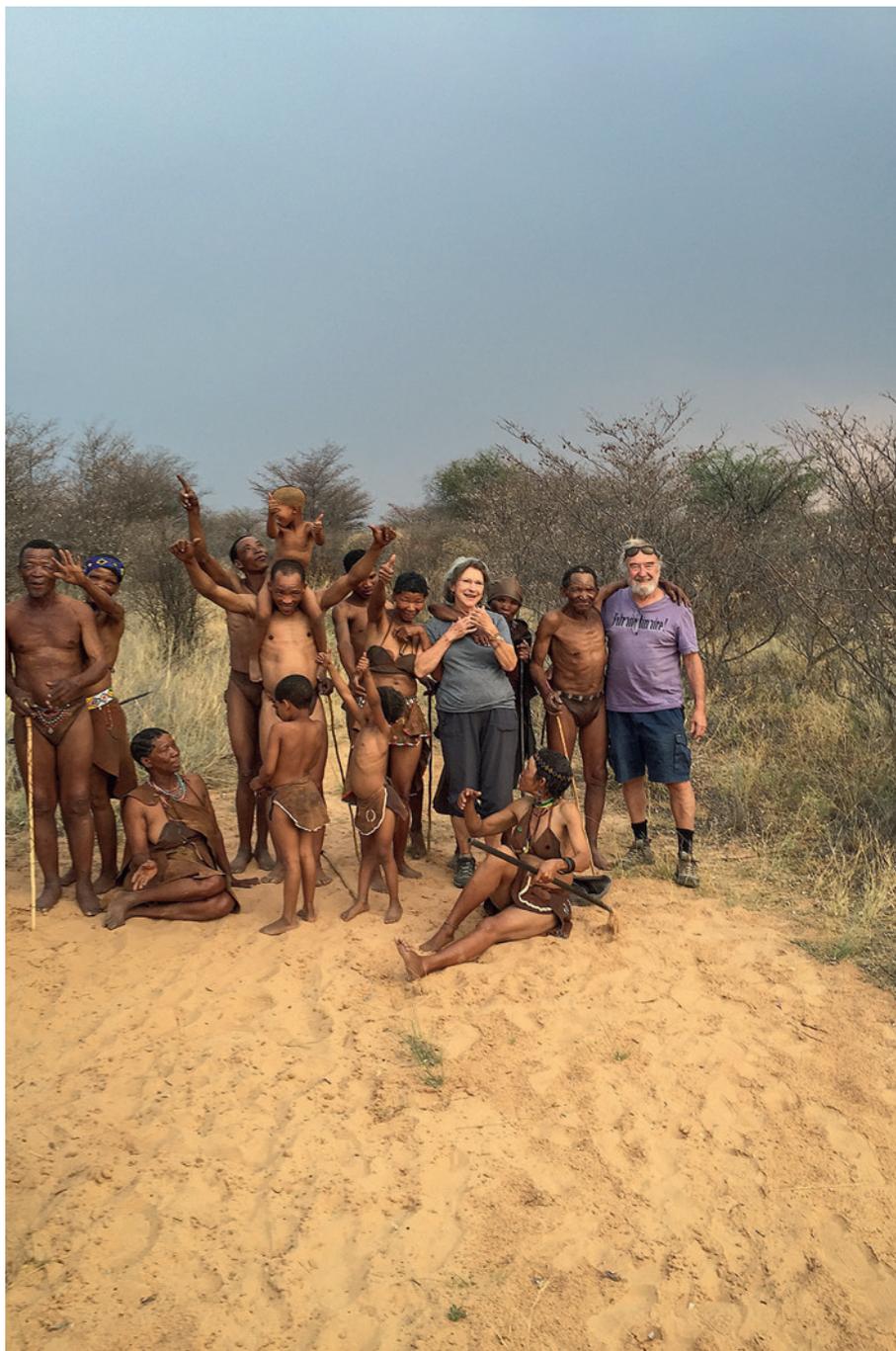
In 2014, we traveled to Bhutan, Burma, and Thailand. The only way we could get a visa to visit Bhutan was to hire a private driver and a private guide. At the time, they only let in a limited number of tourists. We told them we wanted to take a walk every day and to learn about the local expression of Buddhism. In addition, we enjoyed flower baths and took a hot-air balloon ride.

* * *

We've also done our fair amount of celebratory traveling. For my 75th birthday, out of all the places to visit, I wanted to go to Namibia. I remember a big drought that year, but it was very exciting meeting the San people (also known as the Bushmen). They were wonderful. Then, to celebrate our 80th birthdays, Harriet and I went on a French Polynesian and Marquesas cruise.



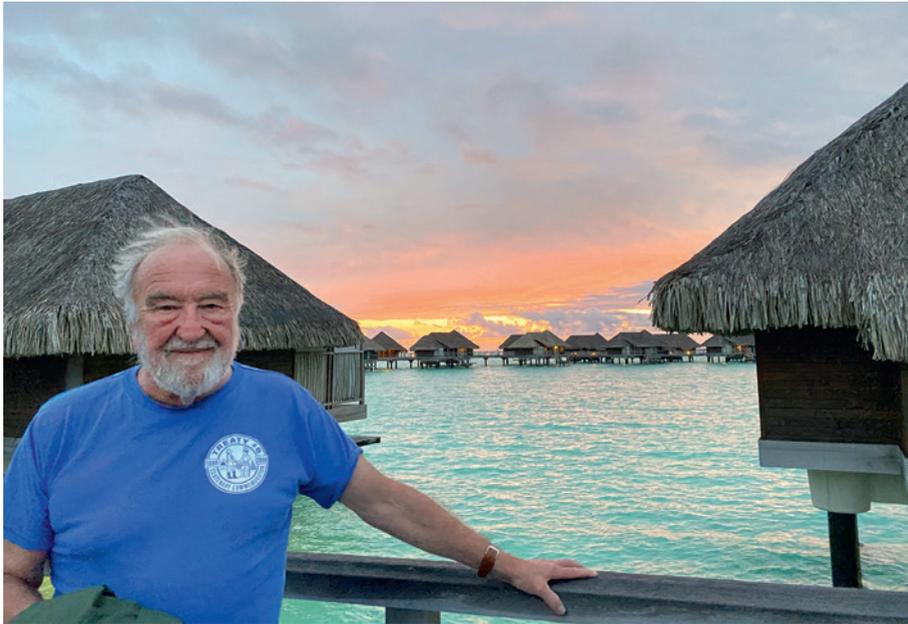
We journeyed to Victoria Falls in Botswana, 2014.



We visited the San people in Namibia, 2014.



The Indigenous People demonstrated their fabulous art and performances in the Marquesas Islands, 2019.



We ended the Polynesian trip by spending a few days in Moorea, 2019.



To celebrate our 80th birthdays, we took a beautiful cruise in French Polynesia on the Aranui 5 ship out of Tahiti, 2019.

That came about because we had met an Indigenous guide when we took our granddaughter Madelyn to Hawaii the previous year. He was a font of knowledge and even knew how to navigate by the stars. When we asked him for recommendations about traveling in the Pacific, he told us we must do a French Polynesian Marquesas tour. It's an art tour conducted by the Indigenous Peoples of the Marquesas Islands and is done only once every 4 or 5 years. It was fabulous.

Our Work-Life Marriage: A Double Helix

I loved my career. Harriet says I was single-minded in my passion and always thought about my lab. But I can't imagine writing about my work without writing about Harriet's. Harriet, too, was very serious about her work; she was always out in the communities, whereas I was always in my lab. She was also the director of her school for several years, so she had administrative tasks that kept her busy. However, she found deep satisfaction in her work fighting for social justice, her United Nations work, her fieldwork with Indigenous communities, and in establishing the McGill Centre for Indigenous Peoples' Nutrition and Environment (CINE).

When she studied the Indigenous Peoples' food systems, Harriet was essentially engaging communities to document the strengths of their local resources, create processes to conserve and recover their healthy food resources, and improve their communities' health. Her work with CINE was conducted in depth with Indigenous Peoples in Canada and eight other countries to develop sustainable dietary patterns using their biodiverse and nutritionally rich local traditional foods. She knew it was essential to bring together interested partners from the area for program planning, and planning had to involve education, capacity-building, and community integration. To do this community work, she knew she had to directly engage the leadership of the relevant Indigenous organizations at the local and national levels with government authorities, universities, local colleges, and local healthcare networks. The first, significant contribution of CINE's Governing Board (1992) was to create the process to establish respectful engagement

with Indigenous communities, including the first research agreements used in Canada for academic-community partnerships for research and education. CINE used these templates for decades, which contributed to developing ongoing research collaborations in Canada and with communities internationally. Since 2003, the World Health Organization has recognized the template and process.

Specifically, Harriet's research and education activities in Canada's North with the Northern Contaminants Program (NCP) recognized that research on contaminants in Indigenous Peoples' food is essentially merged with the research on health benefits and cultural benefits of that same food. Her research with NCP contributed to the international negotiations on controlling emissions of persistent organic pollutants, especially PCBs. She also led the development of a methodology to document the traditional food system within a culture of Indigenous People, which is used internationally with global studies and now online with CINE and at the United Nations Food and Agriculture Organization.

Harriet contributed to and impacted more than 45 cultures of Indigenous Peoples in many parts of the world. That included extensive capacity development for benefit:risk research with their food systems and for finding ways to better use their biodiverse, nutrient-rich resources of local, traditional foods.

In 2017, Harriet received a Fulbright Specialist Award in Public/Global Health from the Bureau of Education and Cultural Affairs of the US Department of State. The award comprised 1) developing a collaborative approach for documenting Indigenous Peoples' food systems and related health circumstances in New Zealand and Pacific countries; 2) building a capacity of faculty, students, and staff; and 3) building lineages for future collaborations.

Someone once told Harriet and me we were the only couple from Switzerland consisting of two senior professors with such intertwined lives. Our careers were very different, but our career moves were always based on whether we could both find employment at any given university. This was rare. And it worked beautifully for us.

Epilog

When I first began this look back on my life, I didn't realize how much I'd accomplished over the years. I'd always thought of myself primarily as a nature lover and adventurer. But I really did love the science. I've always been curious. From early childhood, I found wonder in everything around me. I soaked up the natural world, eventually leading me to the scientific world, where my curiosity continued and could sustain me. It also led me to the love of my life and my family. I was blessed with a curious mind that has made my life full of love for art, music, history, animals, mountains, travel, science (of course), but, above all, the people in my life.

Apart from my natal family, one significant influence in my early years was the family of Hans Weiss. I met Hans when our family moved to Küsnacht in 1950. We were about the same age and friends, spending most of our time in nature in and around our village. His father, a professor of anthropology who taught at the University of Zürich and had also taught for a time at the high school in Schiers, where I later went to high school, taught us how to climb and rappel down cliffs. He filled our impressionable young minds with delightful experiences and stories of nature and people.

Another friend who decidedly influenced me was Uli Lämmli, who graduated a year ahead of me in the program of math and physics at the ETH (Eidgenössische Technische Hochschule) in Zürich, and who subsequently earned a Ph.D. degree in



Hans Weiss,
Swiss landscape
conservationist
and winner of the
Albert Mountain
Award, 2002.

Biological Sciences at the University of Geneva. I was impressed with his path and therefore applied to, and was accepted into, the same program. I was so happy to fulfill my dream of combining biology and physics.

My doctoral supervisor at the University of Geneva was Dr. Werner Arber, who became famous as a Nobel Prize winner. Being his student opened many doors to my future as a university professor. Stuart Linn, a postdoctoral student with Dr. Arber, introduced me to biochemical research, which enhanced my genetics training considerably. He later offered me a postdoctoral position in his research group at the University of California, Berkeley.

My own family with Harriet Kuhnlein coalesced after my Stanford years, as described in this memoir. We continued with professorships at the University of British Columbia (9 years) and McGill University in Montreal (25 years). Our positions at McGill were in the Faculty of Agricultural and Environmental Sciences, with Harriet in the School of Human Nutrition and I in the Department of Animal Science. These positions were created and guided by Dean Roger Buckland and later Dean Chandra Madramootoo, to whom we are forever grateful.



Professors Kuhnlein and Zadworny, 2000.

My collaborators in science and throughout my career are too numerous to be acknowledged separately. Most of them are my coauthors in scientific articles and are listed in my CV. A very special collaborator was David Zadworny, who joined me as a postdoctoral fellow early in the McGill days and stayed with me throughout the rest of my scientific career. We coauthored almost all of our papers. The papers concerning bovine research were exclusively his initiative. He was awarded a professorship in our department.

My graduate students were a special reward for me over the last 25 years. I loved them all. We had a lot of fun, and much laughter in our department emanated from our lab. I loved every day of it!

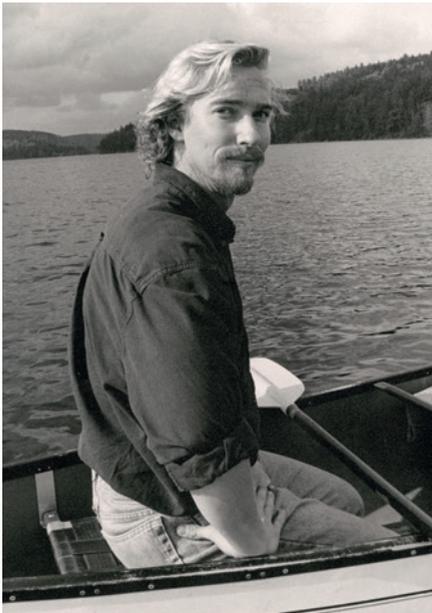
A very special person in my life is my niece, Isabel Kühnlein, the daughter of my brother, Heinz. She asked me to become her godfather when I was still in high school, and I feel guilty for not having done more for her earlier in my life. She assumed the guidance of family affairs in the Ernst Göhner Foundation, which was established by my mother's brother, Ernst Göhner, who, at a later stage in my life, was very instrumental in supporting our family, including myself and the education of our children, as well as the publication of this memoir.



Isabel Kühnlein Specker, Attorney at Law, Zürich/Winterthur, Switzerland, 2015.



Letitia M. McCune, BSc, MSc, Ph. D., ethnobotanist, Tucson, Arizona, 2023.



Matthew C. McCune, BArch, green architect,
in Algonquin Provincial Park, Ontario,
Canada, 1993.



Peter Kuhnlein, BSc, photographer,
mountain guide, and merchant marine,
on Matthes Crest, Sierras, California, 2000.



Veronica M. Haakonsen,
BA, theater artist, 2007.



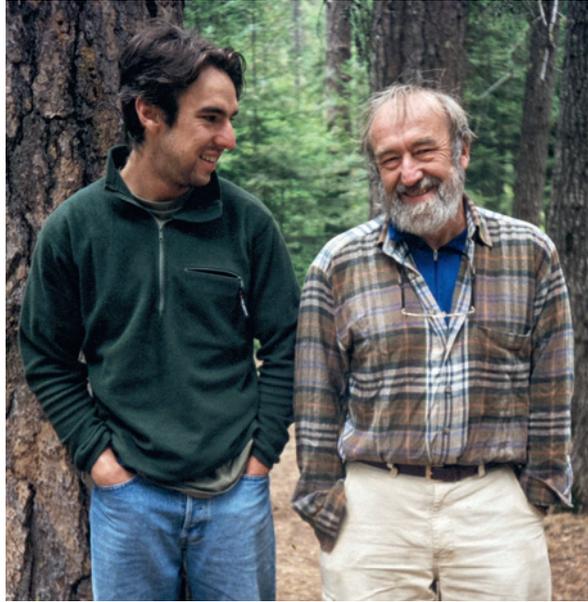
James Urs Magner (Jum),
BSc, geologist, Tucson, Arizona, 2023.



Madelyn J. Kuhnlein,
artist, 2023.



Sophia R. Kuhnlein
with some of her books, 2021.



Peter and Urs Kuhnlein, 2000.

My family has been a special treasure throughout my life. I loved collaborating with my wife, who soon surpassed my career in the number of publications to her name. Harriet had two children from a previous marriage, Letitia McCune and Matthew McCune, and our marriage produced one child, Peter Kuhnlein. As of 2023, our grandchildren are Veronica Haakonsen, James Urs Magner, Madelyn Kuhnlein, and Sophia Kuhnlein. We have had a rich family life, full of learning with each other, enjoying good food and friendships, and having many adventures in music, gardening, pet-caring, and national and international travel. Peter became enamored with the mountains, and is my favorite mountain guide.

It has been a wonderful life.



Celebrating Urs and Harriet's 50th wedding anniversary in July 2022,
in Anacortes, Washington.

From left: Veronica Haakonsen and her husband, Ben Blier, Letitia McCune and
her husband, Dave Magner, Harriet and Urs Kuhnlein, Matthew McCune and his wife,
Tanya Zumach, Madelyn, Lisa, Peter and Sophia Kuhnlein.

Appendix A

Chronology of Family Travel Destinations: 1972–2023*

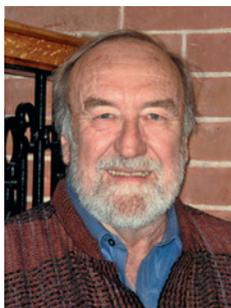
- 1972 Honeymoon trip by car to the Mideast: Switzerland, Austria, Yugoslavia, Greece, Turkey, Iran, Iraq, Jordan, Syria, Bulgaria
- 1975 California mountains (Cathedral Peak), Switzerland
- 1978 Denali (Alaska), Paris
- 1979 France, Switzerland
- 1980 Olympic National Forest, Switzerland
- 1981 Hawaii, Switzerland, Bella Coola (British Columbia), Mexico
- 1982 Spain, Morocco, Switzerland, Austria
- 1983 Bella Coola, Yukon River
- 1984 Disneyland (California) and Switzerland
- 1985 Switzerland, Guatemala
- 1987 Grand Canyon (Arizona), Bryce and Zion Canyons, France
- 1990 Kenya, Tanzania, Scotland
- 1991 North India, Nepal
- 1992 Whistler Mountain, Oaxaca and Puerto Escondito (Mexico)
- 1994 British Columbia mountains
- 1995 Australia, Bali
- 1996 Oregon mountains, Switzerland
- 1997 Old Crow and Crow Flats in Yukon Territory
- 1998 Peru, Belize, Whitehorse (Yukon)
- 1999 Switzerland
- 2000 British Columbia and Alberta mountains
- 2001 Italy, China, Thailand, Cambodia, India, Bangladesh
- 2003–2004 Switzerland, Italy
- 2005 France, Italy, London (England), Nigeria, Kenya
- 2007 Italy

* This is a rough recall of travels with family members. It does not include Harriet's research travels unless they included family members.

- 2008-2010 Moving from Baie d'Urfe in Quebec to Anacortes in Washington State
- 2011 Mexico, Switzerland
- 2012 Paris
- 2013 Hawaii, Galapagos (Ecuador)
- 2014 Bhutan, Myanmar, Thailand
- 2015 Switzerland, Namibia, Botswana, Northeast India
- 2017 New Zealand
- 2018 Switzerland, Hawaii
- 2019 Hawaii, Switzerland, Harry Potter World (Florida), Polynesia and the Marquesas
- 2022 Italy, Switzerland, Germany, Austria
- 2023 Columbia and Snake Rivers (Washington and Oregon)

Appendix B

McGill Professor Emeritus/Emerita Citations at Convocation



Professor Emeritus, 2008

Urs Kuhnlein

MSc (Swiss Federal Institute of Technology)

Ph. D. (University of Geneva)

Urs Kuhnlein earned his diploma in Physics (equivalent to MSc) from the Federal Institute of Technology in Zürich and a Ph. D. in Biological Sciences from the University of Geneva. Professor Kuhnlein was instrumental in discovering restriction endonucleases, a key tool in gene cloning. This discovery was a major component in the work that earned his supervisor, Dr. Werner Arber, the 1978 Nobel Prize in Medicine. Following a postdoctoral fellowship at Stanford University and a position as a research biochemist at the University of California, Berkeley, Dr. Kuhnlein was awarded a scholarship from the Vancouver Cancer Research Institute, where he made important inroads in identifying deficiencies in DNA repair syndromes.

In 1985, Professor Kuhnlein was named to the Shaver-NSERC Industry Chair in Poultry Biotechnology in McGill University's Department of Animal Science. Among his significant contributions was the identification of the quantitative trait loci that affect economically important traits in poultry. In 2000, he was the principal investigator of a Canada Foundation for Innovation Award that resulted in the construction of the Donald McQueen Shaver Poultry Complex at McGill University's Macdonald Campus and a containment facility at the Faculté de médecine vétérinaire of the Université de Montréal. In addition to his work with poultry, Professor Kuhnlein has applied his expertise to DNA fingerprinting to broaden the understanding of population genetics and the mating behaviors of many wildlife species.



**Professor Emerita, 2009
Harriet V. Kuhnlein, FASN**

BSc (Pennsylvania State University)
MSc (Oregon State University)
Ph. D. (University of California, Berkeley)

Harriet Kuhnlein joined McGill University in 1985 as director of the School of Dietetics and Human Nutrition. In 1992, she founded McGill's internationally recognized Centre for Indigenous Peoples' Nutrition and Environment (CINE).

Throughout her distinguished career, Professor Kuhnlein focused on promoting the nutrition and health of Indigenous Peoples. From her earliest work with the Arizona Hopi to her more recent work in CINE documenting the health benefits of traditional food systems, Dr. Kuhnlein's research was instrumental in promoting international policies for the protection of the food resources of Indigenous Peoples. In 2003, in collaboration with the World Health Organization (WHO), she published the first international guidelines for conducting research with Indigenous communities. As chair of the International Union of Nutritional Sciences (IUNS) Task Force on Indigenous Peoples' Food and Nutrition and the CINE Global Health Initiative, she played a key role in developing the nutrition policy of the United Nations.

Throughout her career, Professor Kuhnlein has earned numerous awards. These include an honorary Doctor of Laws from the University of Western Ontario, the Earle Crampton Award for Distinguished Service in Nutrition, and the Jack Hildes International Medal for Outstanding Research in Circumpolar Health.

Appendix C

Curriculum vitae of Urs Kuhnlein

NAME: Urs Kuhnlein
DATE OF BIRTH: 17 September 1940
CITIZENSHIP: Swiss and Canadian
MARITAL STATUS: Married, 3 children and 4 grandchildren
PRESENT POSITION: Emeritus Professor (2008)
Department of Animal Science
Macdonald Campus of McGill University

UNIVERSITY EDUCATION

- 1970–1972 Postdoctoral Fellow of the Jane Coffin Childs Memorial Fund
for Medical Research (with Dr. A.D. Kaiser)
Department of Biochemistry
Stanford Medical School, Stanford, California, USA
- 1965–1970 Graduate studies
Department of Biological Sciences University of Geneva,
Geneva, Switzerland
Ph. D. in Biological Sciences (with Dr. W. Arber)
Certificate of Specialization in Molecular Biology (equivalent to M. Sc.)
- 1960–1965 Undergraduate and graduate studies at the Federal Institute of
Technology (ETH) Zürich, Switzerland
Department of Mathematics and Physics
Diploma in Experimental Physics (equivalent to M.Sc.)

EMPLOYMENT

- 1993–2008 Full Professor
Department of Animal Science
Macdonald Campus of McGill University
- 1985–1991 Associate Professor
Department of Animal Science
Macdonald Campus of McGill University
- 1984–1985 Senior Scientist, Health Sciences Division
Chalk River Nuclear Laboratories, Chalk River, Ontario & Honorary
Assistant Professor, Department of Medical Genetics, Faculty of
Medicine University of British Columbia, Vancouver, B.C.

- 1983-1984 Senior Scientist
B.C. Cancer Research Centre, Vancouver, B.C. & Assistant Professor
Department of Medical Genetics, Faculty of Medicine, University of
British Columbia, Vancouver, B.C.
- 1976-1983 Research Scholar of the National Cancer Institute of Canada, B.C.
Cancer Research Centre & Assistant Professor
Department of Medical Genetics Faculty of Medicine
University of British Columbia Vancouver, B.C.
- 1972-1976 Research Biochemist and Part-Time Lecturer (with Dr. S. Linn)
Department of Biochemistry
University of California at Berkeley, Berkeley, California, USA

OTHER APPOINTMENTS

- 2005-2008 Associate Director, Quebec Poultry Research Centre
- 1991-1993 Associate Dean of Research, Faculty of Agricultural and
Environmental Sciences
- 1986 Associate Member, Department of Biochemistry, McGill University
- 1989 Professeur Associé, Département de biologie, Université Laval

DISTINCTIONS

- 2000 Award of a CFI/Quebec/Industry grant (\$ 5,275,000) to create the
“Montreal Research Centre for the Development of Microbe-free/
Disease Resistant Poultry.” The Centre consists of two facilities, one
on the Macdonald Campus dedicated to work not involving patho-
gens and a containment facility in the Faculté de Médecine Vétéri-
naire (St. Hyacinth) of the Université de Montreal. Principal investi-
gator with 30 coinvestigators. Dr. R. Buckland and Dr. M. Boulianne
raised the industry funds and planned the facilities.
- 1995 Organizer of the members of the NE-60 meeting on Genetic Bases
for Resistance and Immunity to Avian Diseases, Montreal
- 1987 Listing in “Who’s Who in Canada”
- 1986 Listing in “Marquis Who’s Who in the World”
- 1985 Award of the Shaver-NSERC-Industry Chair in Poultry Biotechnology
- 1985 Research Scholarship Award of the Alberta Heritage Foundation for
Medical Research (declined)
- 1983 Organizer of the First Terry Fox Conference on Oncogenes and Cancer
(390 registered participants and 3 future Nobel Prize winners as
speakers) with Dr. T. Pawson
- 1979 Invitation by Dr. Arber to attend the meeting of all contributors to the
work that won him the Nobel Prize in Physiology or Medicine in 1978

- 1977 Selection of the paper “An altered apurinic endonuclease activity in group A and group D xeroderma fibroblasts” (Kuhnlein et al., Proc. Natl. Acad. Sci. USA 73: 1169–1173) as one of the most significant papers in cancer research of the year (Publication in the Yearbook of Cancer)
- 1976 Research Scholarship Award of the National Cancer Institute of Canada
- 1970 Postdoctoral Fellowship Award of the Jane Coffin Childs Memorial Fund for Medical Research

INVITED PRESENTATION AT MAJOR MEETINGS

54th Annual National Breeders Roundtable, St. Louis, Missouri, 5–6 May 2005. Plenary speaker: Gene Networks and the Challenge of Improving Economic Traits in Poultry by DNA Based Selection.

Poultry Workshop of the Plant, Animal and Microbe Genomes XII Conference, San Diego, California, 10–11 January 2004: Regulatory Genes of the Cell Metabolism and Their Association with Differences in Immune Responsiveness and Susceptibility to MD Virus.

Ancillary Scientists Symposium on Genetic Technology Applied to Poultry Production, Newark, Delaware. 11–14 August 2002. Plenary speaker: The Dynamics of Genotype-Phenotype Association.

42nd meeting of the Southern Conference on Avian Diseases. Atlanta, GA. 15 January 2001. Milton Y. Dendy Lecturer (keynote speaker): Molecular Genetics: Progress and Prospects in Resistance to Diseases.

10th International Symposium on Current Problems of Avian Genetics. Nitra, Slovakia. 7–10 June 1993. Invited plenary speaker: Disease Resistance Genetics: Selection at the DNA Level.

International Meeting on DNA Fingerprinting: Approaches and Applications. Bern, Switzerland. 1990. Invited speaker: Identification of markers associated with quantitative trait loci in chickens by DNA finger-printing.

4th World Congress on Genetics Applied to Livestock Production. Edinburgh Scotland. 1990. Invited speaker: Molecular Aspects of Poultry Breeding.

38th National Breeders Round Table. St. Louis, Missouri, May 4–5. 1989. Plenary speaker: DNA Fingerprinting in Chickens Applied to Assess Genetic Variability, Strain Relationships and to Identify Alleles Which Respond to Selection.

Short Course in Molecular Genetics Applied to Animal Breeding and Production. Held in Guelph (1988). Organized by the National Research Council of Canada. Invited speaker.

14th Annual UCLA Symposia. Keystone, Colorado. 1985. Main speaker: Altered AP-Endonuclease in an AT Cell Line: Implications of a Secondary Protein Modification.

Can. Soc. for Cell Biology, Sherbrooke, Quebec. 1985. Main speaker: Evidence for a Novel Secondary Protein Modification in Human Cells Which Mediates DNA Binding of Proteins Associated with DNA Repair.

10th Annual Meeting of the American Society for Photobiology, Vancouver, B.C. 1982. Main speaker: DNA Damage and DNA Structure.

TEACHING

UNIVERSITY OF BRITISH COLUMBIA (1976-84)

- Genetics. 500: Lectures on the Molecular Mechanisms of DNA Repair and Mutagenesis in Prokaryotes and Eukaryotes.
- Oncogenetics. 421: Lectures on Viral and Chemical Carcinogenesis.

Theses supervision

TSANG S.S. M.Sc. (1978) Partial Purification and Characterization of Apurinic Endonuclease Activity from HeLa Cells.

TSANG S.S. Ph.D. (1981) A DNA-Binding Activity from HeLa Cells Which Binds Preferentially to DNA Damaged with Ultraviolet Light or N-Acetoxy-N-Acetyl-2-Aminofluorene.

BERGSTROM, D. M.Sc. (1982) Mutagens in Feces of Vegetarians and Non-Vegetarians (co-supervisor with H.V. Kuhnlein).

BELL, P. M.Sc. (1982) Effect of Diet Modification on Human Fecal Mutagenic Activity (co-supervisor with H.V. Kuhnlein).

TEACHING

MCGILL UNIVERSITY (1985-2008)

- Selected Topics in Molecular Biology. ANSC 622 (since 1998) Metabolic Endocrinology. ASN 424 (since 2003)
- Animal Biotechnology. ASN 420 and Advanced Animal Biotechnology ASN 506 (since 2005). Team-taught with Dr. Bordignon and Dr. Zadworny
- Cellular Biology. 344-202B (1996-1997). Team-taught with 6 other instructors.
- Calculus 1. AEMA 101 (1991-2000)
- Biotechnology. 202-505B (1990): Guest Lecturer on Application of Molecular Biology in Animal Breeding
- Techniques in Molecular Genetics: DNA Fingerprinting. 342-624 A, B, C (1990-1999)
- Special Topics in Animal Science. 342-455 A, B: DNA Fingerprinting in the Bovine (Deschamps, B., 1988)

- Special Topics in Animal Science. 342-691D: Association of Polymorphisms in the Growth Hormone Gene with Body Weight Onset of Sexual Maturity in the Chicken (Zhou J.F., 1990-1991)
- Guest-Lectures: Principles of Animal Breeding (342-301B), Protein Nutrition (342-633A), Techniques in Animal Nutrition (342-630A), Advanced Reproductive Physiology B (342-611), Mammalian Physiology (ANSC 323), Nutrition of Indigenous People (NUTR 620), Nutrition and Society (NUTR 403), Contemporary Nutrition (NUTR 200)
- Teaching for instructors on sabbatical leave: Calculus 2. AEMA 102 (1998)
- Biochemistry 2. ANSC 234 (1995)
- Eukaryotic Cells and Viruses. ANSC 400 (2000) Summer students (1-2 per year)

Thesis supervision and cosupervision

- DAWE Y. M.Sc. (1988) DNA Fingerprinting: A Tool for Detecting Genetic Variability and Strain Relationships in Poultry.
- FOTOUHI N. M.Sc. (1992) Growth Hormone Gene Polymorphisms in Chickens. Winner of a travel award to the World's Poultry Congress in Amsterdam for "The Best Canadian Paper of the Year in Poultry Science."
- LIU N. M.Sc. (1994) Detection of Trait-Associated Restriction Fragment Polymorphisms in Chickens.
- CUNNINGHAM E. M.Sc. (1995) Determination of Inbreeding in Lesser Kestrels by DNA Fingerprinting. Cosupervised with D. Bird.
- PERRAULT S. M.Sc. (1996) Patterns and Correlates of Extrapair Paternity in American Redstarts (*Setophaga ruticilla*). Cosupervised with R. E. Lemon.
- FOURTOUNIS D. M.Sc. (1999) Mutations in the Control Region of the Mitochondrial Genome Linked to Traits of Economic Value in White Leghorns.
- URBANI, N. M.Sc. (1992) Ev-Genes and myb-Gene Polymorphisms in Disease Resistant Chickens.
- LINHER K. M.Sc. (2000) Association of Markers in Genes of the Growth Hormone Axis with the Viral Load in Lymphoid Tissues of Chickens Infected with Marek's Disease Virus.
- MASILAMANI T. J. M.Sc. (2003) Identification of Genetic Markers Associated with Marek's Disease in Chickens.
- FENG X. Ph.D. (1996) Chicken Growth Hormone Receptor and Growth Hormone: Search for Genetic Variants Which Affect Commercially Important Traits.
- KARATZAS, C.N. Ph.D. (1993) Cloning, Characterization and Expression of the Prolactin Gene in the Domestic Turkey (*Meleagris gallopavo*). Winner of an FCAR postdoctoral fellowship.
- RICO, C. Ph.D. (1993) Mating Behavior of the Three Spine Stickleback. Co-supervised with J. Fitzgerald, Département de biologie, Université Laval.
- VILLARROEL, M. Ph.D. (1996) Copulatory Behavior and Paternity in Solitary and Colony Nesting Kestrels. Co-supervised with D. Bird, Department of Renewable Resources, McGill University.
- NADEAU, S. Ph.D. (1999) Migration Patterns of Muskrats in Farmland Ditches. Co-supervised with J.R. Bider, Dept. of Renewable Resources, McGill University.

- LI, S. (1998) Identification of DNA Markers Which Are Associated with Production Traits and Disease Resistance in Chickens.
- URBANI, N. Ph.D. (1998) Microsatellite DNA Analysis of the Snow Crab Mating System.
- PARSANEJAD R. Ph.D. (2004) Phosphoenolpyruvate Carboxykinase and Ornithine Decarboxylase Genes: Allelic Variations and Associations with Traits in Poultry.
- PRASLICKOVA, D. Ph.D. (2007) Association of Markers in the Vitamin D Receptor with MHC Class II Expression and Marek's Disease Resistance.

Postdoctoral Fellows and Research Associates

- ZADWORNY, D. (1987) Physiology of Prolactin.
- BEDFORD, M. (1988-90) DNA Fingerprinting and Allelic Variations of the Casein Genes in the Bovine. Co-supervision with D. Zadworny.
- MOU, L. (1991-92) Identification of alleles which affect quantitative traits in White Leghorns.
- BUCH, J. (1986-88) Restriction Fragment Length Polymorphisms and Expression of the Bovine Milk Protein Genes. Supported by the "Programme d'actions structurantes pour le soutien d'équipes liées au virage technologies" of the Province of Québec.
- NEGRO J. (1994-96) DNA Fingerprinting in Lesser Kestrels. Co-supervision with D. Bird, Department of Natural Resources.
- AGGREY S. (1995-99) Quantitative Trait Genes in Chickens and Dairy Cattle. Co-supervised with D. Zadworny. Recipient of an NSERC postdoctoral fellowship.

UNIVERSITY COMMITTEES

(one or several terms)

- McGill Equipment Grants Committee, Faculty of Graduate Studies and Research
- Animal Science Graduate Student Committee
- Animal Care Committee BioTechSearch Working Group
- Coordinating Committee for Biotechnology at McGill
- Curriculum and Course Revisions Committee of the Faculty of Agricultural and Environmental Sciences
- Cyclical Review Committee of the Institute of Parasitology (member)
- Cyclical Review Committee of the Dept. of Microbiology, Macdonald Campus
- (chair) Ethics Committee of the Faculty of Agricultural and Environmental Sciences
- Tenure Committee of the Faculty of Agricultural and Environmental Sciences Joint Board Committee on Technology Transfer
- Scholarship Committee of the Faculty of Agricultural and Environmental Sciences U1 student advisor
- Senate representative of the Faculty of Agricultural and Environmental Sciences
- Tenure Committee of the Faculty of Medicine of McGill University

CANADIAN COMMITTEES

- 1998 Expert Committee on Animal Breeding and Reproduction,
Agriculture Canada
- 1989 Member of the Steering Committee of the Canadian
Animal Production
Biotechnology Network
- 1991 Member of the Conseil des Recherches en pêche et
en agro alimentaire du Québec Member of the CFI review panel
- 1998 Discussant at the Meeting of the Canadian Agri-Food Research Council

INTERNATIONAL COMMITTEES

- 1986 Member of the Technical Committee of the NE-60 Regional Project
(USA) on Genetic bases for resistance and immunity to avian diseases
- 1986 Member of the Technical Committee of the NC-167 Regional Project
(USA) on Advanced technologies for the genetic improvement of
poultry
- 1993 Member of the Committee on Poultry of the National Animal Genome
Project of the USDA (NRDP-8)
- 2000 Canadian representative at the FAO Meeting on Genetic Diversity in
Livestock (Rome)

OTHER SERVICES TO THE ACADEMIC COMMUNITY

- *Grant reviews*: Medical Research Council/Natural Sciences and Engineering
Research Council (CDRDP, /USDA National Research Initiative Competitive Grants
Program/US-Israel Binational Agricultural Research Development Fund/Inter-
national Foundation for Science/HongKong Research Council
- *Paper reviews*: Animal Genetics, J. of Heredity, Avian Pathology, Poultry Science
- *External examiner*: Ph.D. Theses: University of Guelph (Ph.D. thesis),
Maquarie University, Australia (Ph.D. Thesis) and several M. Sc. theses in the
Faculty of Agricultural and Environmental Sciences
- Numerous sessions as pro-dean or member of the examination committee at theses
defenses

REFEREED JOURNAL PUBLICATIONS

1. ARBER, W. and U. KUHNLEIN. Mutational loss of B-specific restriction of bacteriophage fd. *Pathologia et Microbiologia*, 1967. 30(6): p. 946-52.
2. LINN, S., U. KUHNLEIN, and W. ARBER. Modification in vitro of phage fd replicative form DNA. *Federation Proceedings*, 1969. 28(2): p. 465-67.
3. KUHNLEIN, U., S. LINN, and W. ARBER. In vitro modification of replicating forms of bacteriophage-fd. *Pathologia et Microbiologia*, 1969. 34(3-4): p. 136-62.
4. KUHNLEIN, U., S. LINN, and W. ARBER. Host specificity of DNA produced by *Escherichia coli* .11. in vitro modification of phage fd replicative form. *Proceedings of the National Academy of Sciences of the United States of America*, 1969. 63(2): p. 556-62.
5. ARBER, W., D. WAUTERS-WILLEMS, U. KUHNLEIN, and A. RIFAT. Host specificity of DNA produced by *Escherichia coli* .16. Phage lambda DNA carries a single site of affinity for A-specific restriction and modification. *Molecular and General Genetics*, 1972. 115(3): p. 195-207.
6. KUHNLEIN, U. and W. ARBER. Host specificity of DNA produced by *Escherichia coli*.15. Role of nucleotide methylation in in-vitro B-specific modification. *Journal of Molecular Biology*, 1972. 63(1): p. 9-19.
7. SMITH, J.D., W. ARBER, and U. KUHNLEIN. Host specificity of DNA produced by *Escherichia coli* .14. Role of nucleotide methylation in in-vivo B-specific modification. *Journal of Molecular Biology*, 1972. 63(1): p. 1-8.
8. KUHNLEIN, U., E. E. PENHOET, and S. LINN. Altered apurinic DNA endonuclease activity in group-a and group-d xeroderma pigmentosum fibroblasts. *Proceedings of the National Academy of Sciences of the United States of America*, 1976. 73(4): p. 1169-1173.
9. KUHNLEIN, U., B. LEE, E. E. PENHOET, and S. LINN. Xeroderma pigmentosum fibroblasts of D group lack an apurinic DNA endonuclease species with a low apparent Km. *Nucleic Acids Research*, 1978. 5(3): p. 951-960.
10. KUHNLEIN, U., B. LEE, and S. LINN. Human uracil DNA N-glycosidase - studies in normal and repair defective cultured fibroblasts. *Nucleic Acids Research*, 1978. 5(1): p. 117-125.
11. LINN, S., W.S. LINSLEY, U. KUHNLEIN, E. E. PENHOET, and W.A. DEUTSCH. Enzymes for repair of apurinic-apyrimidinic sites in human cells. *Journal of Supramolecular Structure*, 1978: p. 11.
12. KUHNLEIN, H.V., U. KUHNLEIN, and H.F. STICH. Determination of fecal mutagens. *Federation Proceedings*, 1979. 38(3): p. 713.
13. STICH, H.F. and U. KUHNLEIN. Chromosome breaking activity of human feces and its enhancement by transition metals. *International Journal of Cancer*, 1979. 24(3): p. 284-287.

14. KUHNLEIN, U., S.S. TSANG, and J. EDWARDS. Characterization of DNA damages by filtration through nitrocellulose filters - simple probe for DNA-modifying agents. *Mutation Research*, 1979. 64(3): p. 167-182.
15. KUHNLEIN, U., S.S. TSANG, and J. EDWARDS. Characterization of DNA damages by filtration through nitrocellulose filters - simple probe for DNA modifying agents. *Environmental Mutagenesis*, 1979. 1(2): p. 162-162.
16. KUHNLEIN, H.V. and U. KUHNLEIN. Fecal mutagens from subjects on defined formula diets. *Federation Proceedings*, 1980. 39(3): p. 647-647.
17. KUHNLEIN, U. Disulfiram inhibits DNA breakage by hydroxyl radical-producing agents. *Biochimica et Biophysica Acta*, 1980. 609(1): p. 75-83.
18. KALFAS, C.A., E.G. SIDERIS, S. ELKATEB, P.W. MARTIN, and U. KUHNLEIN. Determination of rotational correlation times from perturbed angular-correlations of gamma-rays-in-111 bound to single-stranded-DNA and DNA[Cu²⁺]. *Chemical Physics Letters*, 1980. 73(2): p. 311-314.
19. KUHNLEIN, U., S.S. TSANG, and J. EDWARDS. Cooperative structural transition of PM2 DNA at high ionic-strength and its dependence on DNA damages. *Nature*, 1980. 287(5780): p. 363-364.
20. KUHNLEIN, U., D. BERGSTROM, and H. KUHNLEIN. Mutagens in feces from vegetarians and non-vegetarians. *Mutation Research*, 1981. 85(1): p. 1-12.
21. TSANG, S.S. and U. KUHNLEIN. DNA-binding protein from HeLa cells that binds preferentially to supercoiled DNA damaged by ultraviolet light or N-acetoxy-N-acetyl-2-aminofluorene. *Environmental Mutagenesis*, 1982. 4(3): p. 401-402.
22. MARTIN, P.W., S. ELKATEB, and U. KUHNLEIN. Conformational changes in supercoiled DNA - in-111-labeled histone as a label for perturbed gamma-gamma angular-correlation studies. *Journal of Chemical Physics*, 1982. 76(7): p. 3819-3822.
23. KUHNLEIN, U., R. GALLAGHER, and H.J. FREEMAN. Effects of purified cellulose and pectin fiber diets on mutagenicity of feces and luminal contents of stomach, small and large bowel in rats. *Clinical and Investigative Medicine - Médecine Clinique et Experimentale*, 1983. 6(4): p. 253-260.
24. KUHNLEIN, H.V., U. KUHNLEIN, and P.A. BELL. The effect of short-term dietary modification on human fecal mutagenic activity. *Mutation Research*, 1983. 113(1): p. 1-12.
25. KUHNLEIN, U., S.S. TSANG, O. LOKKEN, S. TONG, and D. TWA. Cell lines from xeroderma pigmentosum complementation group A lack a single-stranded-DNA-binding activity. *Bioscience Reports*, 1983. 3(7): p. 667-674.
26. KUHNLEIN, U. Comparison of apurinic DNA-binding protein from an ataxia telangiectasia and a HeLa cell line - evidence for an altered processing of apurinic apyrimidinic endonuclease. *Journal of Biological Chemistry*, 1985. 260(28): p. 4918-4924.

27. KUHNLEIN, U., M. SABOUR, J.S. GAVORA, R. W. FAIRFULL, and D.E. BERNON. Influence of selection for egg production and Marek's disease resistance on the incidence of endogenous viral genes in White Leghorns. *Poultry Science*, 1989. 68(9): p. 1161-1167.
28. KUHNLEIN, U., J.S. GAVORA, J.L. SPENCER, D.E. BERNON, and M. SABOUR. Incidence of endogenous viral genes in 2 strains of White Leghorn chickens selected for egg-production and susceptibility or resistance to Marek's disease. *Theoretical and Applied Genetics*, 1989. 77(1): p. 26-32.
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Professor Urs Kuhnlein is an accomplished molecular biologist, a celebrated mountaineer and nature lover, and a devoted member of an extended family that stretches from Switzerland to Canada and the United States. He graduated from the Eidgenössische Technische Hochschule Zürich (ETH) and the University of Geneva in Switzerland and excelled academically, eventually becoming Emeritus Professor at McGill University in Montreal, Canada. In this volume, he vividly recalls his summit experiences from the first on the Bietschhorn in the Canton of Wallis to Denali in Alaska. His colleagues, students, friends, family, and like-minded adventurers will recognize his keen interests in and rich insights into the diverse worlds captured in this memoir. Urs now lives on Fidalgo Island in the San Juans of Washington State.

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