# Rediscovery of the Elements

## VISITING THE LAND OF THE CURIES.

### Part 1. Tous le monde est en grève! (Everyone is on strike")



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In the 2001 Spring issue of *The Hexagon of Alpha Chi Sigma,* the first issue of the Rediscovery of the Elements series appeared, and since then 57 articles appeared to cover the entire project, culminating in the 2016 Summer issue, shortly after the unfortunate passing of Jenny in 2014. These articles can be found on the Rediscovery website: www.chem.unt.edu/~jimm/REDISCOVERY

Many curious readers have queried,"Why did you take on this grand project? What was it like to actually be the first to revisit all of these sites of discovery of the elements?" In an attempt to answer these questions, a new series of articles have been written, starting in 2017. So far, 14 articles have appeared (these may be found at alphachisigmahexagon.com). Within this new series, a critically important site has been Paris, which was, among other things, the location of Lavoisier's revolutionary studies recognizing the true elements. The next several articles will be devoted to Paris and other French locations.

**Arriving in Paris on the train.** "Wake up, Jenny! Nous sommes arrivés! We're here!"

Jenny blinked, opened her eyes, yawned broadly, and took a big kitty-stretch. She straightened up in her seat and looked out the train window at the stream of passengers hurrying by on the station platform. "Where is 'here'?"

"Gare de l'Est. East train station of Paris. We're finally at the home of Marie Curie, your favorite scientist."

"Oh, goody!" She yawned again, then slid out into the aisle. I pulled down her pack from the overhead rack and handed it to her."Check your passport."

She tugged at the strap around her neck and pulled up the pouch beneath her sweat shirt. "Passport, credit cards, money, all here."

We jumped off the train on the concrete platform."This is huge!"exclaimed Jenny, as she gawked about the cavernous station."As big as the Houston Astrodome!"

"And it's not as big as Gare du Nord, 5 minutes' walk from here. That station serves London and points north. We came from the east, München (Munich), ultimately from our visit in East Europe."

"Romania only two days ago!"she marveled. "We're back in hustle and bustle of the big city."

"And how. Paris has the busiest train stations in all Europe."

We climbed out of the car and walked into the main station. People were scurrying about, catching or leaving their train; or lounging in the outside restaurants, waiting for their connections. Various shops populated the area, selling casual clothes, recent fashions, souvenirs, postcards, books and newspapers.

"Look for the Metro—big blue circled M."

"Metro? Another train?"

"No, the Underground. Subway. There it is, above that exit door."

Through the door, then down a long sloping ramp."There's a map,"I said, pointing to a layout on the wall."The map is similar layout to London's Underground—beautiful, simplistic, user-friendly. Excellent. Let's see . . . our travel agency said we needed to go to La Fourche Metro Station." I traced my finger up the line tracking from the train station northward across the Seine."Here it is, up here, about 4 kilometers away. La Fourche—translated, 'the fork'—where the main street forks."

"I'll have to get used to kilometers," said Jenny.

"Multiply by 5/8 to get miles," I said. "It's about 2½ miles away." "Too far to walk,"replied Jenny.

We got into the car just as the doors whooshed shut. The car started up with a jerk.

"Do you understand what everybody's saying?" she asked. "Not yet," I said. "It usually takes two days or so for me to get my 'new ears.' Just remember—the French are a people with a history of world preeminence. In the 1700s, they were the center of fashion, science, politics. They have a special pride in their culture, centering on their language. So whenever we have a question, we'll have to plunge right in, speaking their language."

The car braked and stopped."Whoops, here we are at La Fourche, off we go."

We got off the Metro and took the stairs to the street level. I continued, "We'll have to remember not to speak to anyone in English. They hate that. They think it is presumptuous of an American or Brit to expect them to immediately start talking in English. A Frenchman once told me, 'In America, I speak English. In France, you speak French.' And always, always, greet them with 'Bonjour' before you say anything else . . . Then I have a favorite phrase that I used when I visit France: 'Je sui désolé que je parle de votre belle langue mal.'"

"What does that mean?"

It means,"I regret that I butcher your beautiful language."

Jenny giggled.

"Usually after a few moments, if you get lucky, they will give up, and if they speak English, will say, 'Oh, that's OK, we can talk in English.' Because you have already proven that you are inferior to them, and your culture and language is inferior, and you recognize it. It maintains their pride."

"Whew!" said Jenny as we emerged into daylight. "It looks completely different!"

The neighborhood was typically Haussmann. Georges-Eugène Haussmann in the mid-1800s was the renovator of Paris who completely changed the city from a medieval, cramped maze of streets to boulevards, wider streets,



*Figure 1. The Sony Mavica, one of the first digital cameras, served the authors well during the period 1998–2005. Jenny, a photography and computer teacher in Denton, Texas, chose this camera specifically for its ease of operation. This camera, launched in 1997, stored jpg photographs on a 3.5-inch floppy disk, years before the more advanced cameras and flash drive storage devices.*

parks, fountains, and large buildings with a common design.

"Aren't we pretty far from the Curie Museum?"

"Unfortunately, yes, about 5 miles. This was the most economical bed & breakfast our travel agency could find," I said. I looked down at my notes, "71 Avenue de Clichy. It's supposed to be very close."

After only a few paces, Jenny spotted it, "There it is, you can see the '71' above the red door." Up the stairs we went until we found the third level, where the advertised tenet lived. "Her name is Êmilie Brassard." We knocked on the door and a petite lady answered, perhaps in her thirties, her hair bunned up.

"Bonjour!" Jenny and I chorused.

"Bonjour to you, too. You must be Monsieur and Madame Marshall. I am Êmilie. Pleazze come in. Welcome to my flat."

"Thank goodness," whispered Jenny. "She's speaking English." The abode was a small cozy apartment with a living room, kitchen and eating area. The entire walls of the living room were converted into bookcases. "Come this way," she led us to our room, plain with a bureau, a bed, and a chair. "You can put down your packs here. That's good. Here is where you stay. Here is a key to get in the main door of my apartment. Now come with me and I will show you the bathroom." She led us into the bathroom two doors down. "Here is the toilette. Pleazze do not put paper down the toilet, it will clog it. Put used toilet paper in the waste basket. The toilette has a motor that grinds la merde, but it cannot grind up paper."

Being the daughter of her earthy cowboy family, Jenny muttered, "Poop flows, but paper work stops progress; that's what my dad said about his school when he was principal."

"Come wiz me to the kitchen, and I will fix you coffee." "Yummee!" said Jenny. Like my mother, Jenny always had to have her coffee, it always perked her up.

Êmilie started the percolator and sat down with us at the table. "We are still using francs, even though the Euro has just been adopted this year (1999). Is that okay?" "Yes, we exchanged money into francs in the U.S. before leaving. I think we have enough already for you," I said. "Très bon," as she received the bills we counted off to her. Then she poured us coffee, "Sugar? Milk?" and sat down again with us.

"So I understand from your telephone call that you are studying French scientists. I know little about scientists. I am studying French literature. Tomorrow breakfast will be at 7 a.m., is that okay?"

"Super. We are visiting the Curie Museum, in the Latin Quarter, near the Sorbonne."

"Très bien. Good evening, we will see you tomorrow early. For tonight, there are nice cafes down the Avenue for your evening meal. Take your time and drink your coffee. Bon appetit et bonsoir!" She adjourned to her bedroom.

**The following morning.** It was the big day, our first full day in Paris. Jenny was all bubbly. Jenny had thoroughly studied up on Marie Curie. Mme Curie was the first female professor at the Sorbonne, arguably the woman who broke the glass ceiling for female scientists. She was the person whom we used in our university chemistry classroom to serve as a model for aspiring modern women scientists.

Êmilie had croissants and coffee ready for us. We all sat down together at the kitchen table. "Êmilie is a pretty name," I said, "reminds me of Êmilie du Châtelet, who translated Newton's Principia into French."

"Oh, yes, I have learned of Êmilie du Châtelet. She is my héroïine. She was a mathematician. She and Voltaire were—how do you say—collaborateurs. Voltaire was my speciality in my classes. He lived in the home of Madame du Châtelet for a while."

"Jenny's favorite scientist is Marie Curie," I said. "The Curie Museum is expecting us. We were able to telephone them, long distance, to get reservations. It's in the Latin Quarter, 8 kilometers away. We will take the Metro."

Êmilie said, "What are you taking with you?"

Jenny showed her belongings, one by one, "Bag with notebook, two cameras—our new Sony Mavica digital camera (Figure 1), and a 35-mm Canon SLR camera as a backup."

"And I have my GPS," showing the Garmin receiver dangling from my belt. "We record every location we visit in Europe. I acquired it when I was a flight instructor in America. I have one of the first models."

"And walking shoes!" said Jenny, pointing to her hiking boots, still red-stained from the hematite mud of the Apuseni Mountains of Romania.

We finished up breakfast, grabbed our paraphernalia, and took off—one block down the street, then down the stairs to the Metro.

"Aren't we lucky we got an apartment so close to the Metro!" I said.

"Isn't this going to be fun!" Jenny giggled.

We reached the bottom of the stairs.

And stopped short!

A green iron grate blocked the entrance, reaching 20 meters across and 5 meters high. It was like the bars of a jail. The entrance was totally blocked, and it was dark beyond.

"What the . . . !" I exclaimed.

"What is it, Jimmy? What's going on?"

A sign was posted on the gate, "EN GRÈVE."

"What does it mean?" asked Jenny.

"Oh, no . . . They're on strike."

Several other pedestrians had come down as well, but each had taken a quick look and promptly turned around and returned upstairs.

"What does that mean?"

"I don't know. Maybe we can take the bus. Let's walk upstairs."

At the top of the stairs, a kindly-looking gentleman with a mustache was watching us, leaning on a cane, relaxed and unperturbed. He must have seen our distress as we labored up into daylight.

Instinctively, I said, "Bonjour."

"Quel domage," he said, "what a pity. No Metro."

I cried, "What can we do? Autobus?"

"Zhey are on strike, too," said the kind gentleman. "No Metro, no bus."

"Taxis?" I blurted out.

"Tout le monde est en grève. Everyone is on strike." "With no prior announcement?" I cried in distress. "Oh, Jimmy, we will miss our appointment!"

"We need to get somewhere across town," I was now talking to no one in particular.

The kind gentleman was not excited; he seemed to be used to this sort of thing in Paris. "You will just have to use zhee feets." He pointed to our shoes with his cane.

Impulsively, I said, "Let's go, Jenny. We have a map." "Good luck, my friend," said the kind gentleman.

We turned to go, but then: "Oh, Jimmy, I left the Canon down there. I took it off for a minute. I got so preoccupied I forgot about it."

We plunged down the stairs.

"I left it right here!" She pointed to a spot on the ledge, next to the green bars. "My pack was heavy and I just put the camera down for a second! It has to be here! It has to be!" But it was gone. By now she was bawling like a baby. Immediately I took her up, "It's OK, Jenny, it's OK! Jenny, it'll be all right!" "No it won't!"

We had to make sense out of this. "We just ran out of Beginner's Luck," I managed.

"Whaaaat?"

"Remember the mountain in Romania, where we were thrilled about finding the Fascebánya Mine? Remember how we earlier talked about Beginner's Luck? Remember Paulo Coelho?"

"I'm too sad—and mad—to remember anything right now. That was so stupid of me!"

"Coelho told us that the forces of nature allowed us to realize easily our first task, even though it was the most difficult one. But we didn't talk about what Coelho said what would happen next." She turned her face up to mine, eager for explanation.

"He said that when Beginner's Luck no longer functions, persistence and courage become more important. In fact, in the end, one's search is always severely tested."

She was unconvinced. "There must be a reason for this."

"Yes. There has to be."

Jenny then did the most amazing thing. She dried her tears on my jacket, sniffled, and then hitched herself up, holding the digital camera strap tightly. "Let's get going then." As we mounted the stairs, she said, "But I still feel like an idiot."

I stopped her halfway up, "I think I've got it!" I turned to face her, "We're supposed to go digital. Totally. From now on."

"Why?"

"We're in the digital age. We need to photograph everything digitally from now on. Jenny, you know we don't know what the pictures look like on the 35-mm film until it's developed. But now we know immediately whether or not a photograph is what we want. We can erase photos from our disks and record over them if we need space. We can retake them if we know we need another. It's a sign that we should break the habit of photographic film, time to move into the new digital era completely." (Figure 1)

Hope dawned on her face. "It's like a hand came down out of heaven and snatched away the camera."

"Didn't need a heavenly hand. It got stolen."

"But why the strike? Of what use is that to anybody? What good does it do for us?"

"Jenny, I'll bet you by the end of today—I predict—that we will know the answer to that question. Maybe just a chance to get acquainted with Paris. We'll be here quite a while."

"Well, let's get going." We started climbing up the stairs again.

"We have to use zhee feets." I pointed to our shoes with an imaginary cane.

She laughed as we emerged at street level. "Which way?" she asked.



*Figure 2. Place de la Concorde, a major public square, where Lavoisier was guillotined, as well as many other notables, including King Louis XVI and Marie Antoinette.*

"Here, I have a map," as I pulled it out of my back pocket. "We go south, down the Avenue de Clichy from 'la Fourche,' the fork in the streets here at the Metro station."

Jenny opened her pouch and would you believe it, she even had a magnetic compass. She rotated the disk so that the painted needle pointed "N" on the dial. "That way is south," she pointed downhill.

"Yes, toward the Seine."

She put away the compass and shifted her pack and camera. "Wouldn't it be nice if we could call the Museum, to let them know we will be late?" I answered, "Well, maybe someday there will be such a thing as satellite telephones. Maybe when the 21st century arrives."

Off we marched, striding downhill, past the shops with the latest fashions of clothes and shoes, the pharmacies, the markets. After half a kilometer, we reached the Place de Clichy, a monument with a bronze statue of someone in the center of a convergence of six streets. The traffic was getting quite heavy.

"Who's that?" asked Jenny.

"Maréchal de Moncey. Prominent leader in the Revolutionary and Napoleonic Wars. I'm not quite sure what he did. The French celebrate anybody and everybody." I checked the map, "let's turn down Rue d'Amsterdam." Still heading south, now passing by restaurants and boutiques, then past the Haussman Saint-Lazare train station. "There are six main train stations in Paris," I said. "Paris is busy."

We sat down on a bench, took a few gulps of water, and rested for a few minutes. We started up again, down Rue Tronchet to the L'église de la Madeleine, a huge Roman Catholic Church with huge Corinthian columns, "Built to the glory of Napoleon's army," I told Jenny. And then finally down to a huge public square with an oval drive surrounding it, at a confluence of streets from all directions. A huge obelisk stood in the center, towering above the scene.

"This is the Place de la Concorde, built in the mid-1700s (Figure 2). Covers 20 acres. The obelisk, that's the Luxor Obelisk, imported from Egypt during the 1800s," I said as I dumped my pack on the sidewalk next to the stone fence surrounding the obelisk. "Good resting place." Jenny did likewise. "How far have we come?" she asked.

"About 3 kilometers." Pointing to the south, "That's the bridge crossing the Seine." Turning back to the obelisk, "This is actually very important historically. It was called Place Louis XV originally. There was a statue of him here, but the rioting revolutionaries tore it down. This is the main site for the guillotine executions during the French Revolution. King Louis XVI and Marie Antoinette were beheaded here. The blood ran so profusely, it is said, that you couldn't walk across the pavement without slipping."

"Ugh."

"The 'Citizens' of the Revolution renamed it Place de la Révolution, but then they changed it to its present name, Place de la Concorde. But important to us," as I waved my hand toward the towering 23-meter obelisk, "this is where Antoine Lavoisier met his demise."

Jenny perked up. "The father of chemistry!"

I chuckled, "Yes, sweetie, you have certainly learned your chemical history! Yes, he recognized 31 chemical elements." "But he didn't do that here," Jenny pointed at the obelisk.

"Oh, no, in his laboratory, many kilometers that way, to the northeast. We'll research that later in our Paris travels."

"He didn't die a hero?"

"No, he was an 'enemy of the people.' They guillotined him, along with thousands of others."

"How did he get them so mad?"

"He was a tax man. That's how he made his money. Remember the Place de Clichy? We saw it half an hour ago," I looked to the north. That was the entrance to the city. There was a wall there. Every commodity that passed into the city, was taxed there. Clothing, food, lumber, tobacco, everything. Lavoisier was in charge of the money-making enterprise. He was essentially the gate-keeper—in absentia, of course. He was also in charge of gun powder production, which was most important to the government."

"So he did both good things and bad things."



*Figure 3. The courtyard of the Sorbonne, the famous medieval university of Paris. Marie Curie was the first female professor at this university.*

"There once was a bronze statue of him, beside the Madeleine, which you saw a half hour ago. The Nazis melted it down when they occupied Paris in the 1940s."

Jenny said, "So before Lavoisier, the elements were fire, earth, water, and air. Aristotle's elements." I answered, "More technically, Empedocles, who lived a century earlier. Aristotle added a fifth element, "quintessence, the 'stuff of stars.' Lavoisier performed chemical experiments to show that water was not an element, but a compound. He combined 'vital air' and 'flammable air' to form water. He even gave new names to vital air and flammable air – oxygen (acid maker) and hydrogen (water maker)."

"Where is Lavoisier's grave? Is there a tombstone?" she asked.

"His body—and head—were dumped unceremoniously in a common grave. Tragic."

She looked around. "Time to go?"

"Let's do it." We hitched up our packs. "Now we head east, on the north side of the Seine. It's called the 'right bank.'" I checked my map. "We will pass right by the Louvre."

"What's the 'right bank'?"

"The 'left' and 'right' banks of the river. Stand facing downstream, your left hand is the left bank, your right hand is the right bank."

In 15 minutes, we were passing by the grandiose art museum, the Louvre. "It was once the palace of the kings. Later even served as the chambers for the Académie des Sciences. Oh, and look here," there was a sign announcing a beautifully manicured lawn next to the wall of the Louvre, "Jardin de l'Infante—This is the site where Lavoisier used a huge lens to concentrate the rays of the sun to perform some experiments in closed containers. Burned carbon and sulfur in sealed jars. Learned from these experiments that the air was not just a medium for chemical reactions, it contained one of the reactants. This mysterious 'air' was an invisible vapor known only for what it could do to combustible materials—make them burn."

"Oxygen," said Jenny. "Yep," I answered.

"So he discovered oxygen."

"Er, not quite. Priestley in England and Scheele in Sweden did that. But Lavoisier was the first to understand what he had."

"So one could make the argument that he was a co-discoverer?"

"Jenny, you are a genius! As a matter of fact, there was an entire play based on this, called appropriately enough, *Oxygen*. Written by Carl Djerassi and Roald Hoffmann. They dealt explicitly with the question you raised. You know, Jenny, one can see why my colleagues mistake you for another PhD graduate!"

We continued to stroll along the right bank of the Seine, passing vendors, artists, shops, hawkers, and lots of people, mostly tourists, but also denizens—and a few pickpockets, easily identifiable because of their shifty eyes and their darting paths through the crowds, searching for their prey.

"Keep your possessions tight," I cautioned.

After 10 minutes, I suggested, "Let's cross the river here, to the left bank. This is Pont Neuf." "Sounds familiar," Jenny answered.

"It should. This, in a sense, launched Madame Curie's ultimate career. Her husband, Pierre Curie, was killed here in a traffic accident."

"Run over by a horse cart!" cried Jenny. "Hauling military uniforms!"

"Leave it to Jenny to know that," I smiled. "She then proved herself to be gutsy and independent. She elected to go on, never got married again."

We were half way across the bridge. We stopped to look upstream. "Notre Dame is up there, almost a kilometer away … Pierre died here." She squeezed my hand. "You won't leave me, will you, Jimmy? Ever?"

I squeezed back, "No, Jenny, I won't be going anywhere." "We must finish this project of Rediscovery," Jenny said as she grit her teeth. Nothing will happen to either of us. Ever."

"But . . . if . . . if we ever have to make the same decision that Marie faced . . . the other must go on," I countered. Jenny closed her eyes and offered a silent prayer, her lips moving slightly. Then whispered: "Marie Curie could do it. I couldn't." "No, Jenny," I said, "we don't need to worry about this now. We just need to keep on with our project. 'Don't stop believing!'"

She tugged at me, "Let's go."

We turned left at the other side of the river and walked along the left bank for a few minutes. And then: "Jenny, there's Notre Dame. You can see it now! About one-half kilometer away."




*Figure 4. The street in the Sorbonne where the museum of Madame Curie was found.*

"We'll visit it sometime."

"Yes, let's turn right, away from the river. The left bank. Into the Latin Quarter."

In another 10 minutes, we were entering a huge park, with huge expanses of green lawn, hundreds of denizens sitting on the grass, chatting away or lying back and taking in the sunshine. Others were strolling along, some eating ice cream and some walking dogs. And dozens of chess players, intently studying their boards.

"This is le Jardin du Luxembourg," I said. "Almost 400 years old. Let's cross the street here, out of the park. We're almost there."

"Oh, good! Jimmy, I'm really getting tired."

In five minutes, we were passing by the Sorbonne, "Look at the dome (Figure 3). That's exactly what is shown in the movie about Madame Curie, the one you and I show in our intro chemistry class. The Sorbonne dates from the 12th century." At the base of the dome was a large courtyard with tables full of students drinking wine and beer, all in the cool shade of linden trees with rich foliage. A string quartet was playing on one side of the courtyard.

"Refreshing," said Jenny. "Reminds me of my days as a music major at the University of North Texas."

And then after three blocks, I pointed "Jenny, look at the street sign!" (Figure 4).

Jenny read, 'Rue de Pierre et Marie Curie.' This is the street of Pierre and Marie Curie."

"This is where the museum is. It's that building at the end of the block. We're here."

"I hope they're open! … Would they be on strike?" ◯

*To be continued…*