

## ***14 – Better Living Through Chemistry***

**A**fter barely managing to secure a high school diploma, I started my college career, which would ultimately take twenty-three years to complete.

I attended Montgomery College, the local 2-year community college in 1970. I made the Dean's List first semester. By the end of the second semester, I was getting "C"s and "D"s and "F"s. I guess college wasn't ready for me, so I gave them some time to prepare themselves.

A few years later, I realized that I really should get me some college education, so I went back to Montgomery College, and in the evenings, took some classes which interested me - Economics, Electricity, Photography, Physics. But my real love was chemistry.

Many of the faculty members at Montgomery College were retired professionals. They had spent their lives working in their chosen fields, and then brought their experience into the classroom.

My first college chemistry class was General Chemistry 101. I don't remember much about this class except for two amazing occurrences. First, the teacher had spent his career working at the U.S. Navy's Naval Ordnance Laboratory (NOL) in Silver Spring, Maryland. About halfway through the semester, he told us a story about one of his projects.

The 1971 movie, *The French Connection*, starring Gene Hackman, told the story of how opium, grown in Turkey was smuggled into France, where it was refined into heroin in clandestine laboratories in Marseille. The heroin was then smuggled into the United States. This went on from the late 1930s into the early 1970s, when drug agents from France, Italy, Canada

and the United States finally broke the mafia-based organization and shut down the illegal labs in Marseille.

The Bureau of Narcotics and Dangerous Drugs (forerunner of the modern Drug Enforcement Administration) needed a way to detect the illegal heroin labs. They developed “sniffers” that could be mounted in helicopters and used to discover the clandestine labs in buildings below. The problem was that they had no actual heroin labs to test the sniffers on. So they contacted the Naval Ordnance Laboratory.

Our professor, head of the chemistry department there, had a new project. The BNDD supplied raw opium, and NOL processed it into heroin. BNDD flew their helicopters over NOL’s little heroin lab, and calibrated their sniffers. Once perfected, the sniffers were sent to France, where they were flown over suspect areas of Marseilles, and the hidden labs discovered.

Our professor reported that he had a major productivity problem. The heroin they produced was a fine powder, and any disturbance would cause the powder to float in the air around the room. The scientists were falling asleep on the job!

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General Chemistry 101 also produced a major effect on my life. There were two really cute girls in the class. I got up the nerve to ask the cutest one out on a date, but she said no. Then I asked the second-cutest girl out, and she said yes. I took Barbara out to a party on Christmas Eve, and didn’t bring her back home until about 4am on Christmas Day. Although we didn’t start dating seriously for several years, I had set the hook, and Barbara would eventually become my wife.

My first semester Organic Chemistry teacher had been in the ivory tower way too long. One experiment involved hooking up a vacuum pump and a bunch of rubber tubes to a variety of glassware. This was so complex that the teacher decided to oversee setup of the apparatus at one student station. Once that was successful, the other students could then copy the setup.

Of course, Mr. Ivory Tower hooked up the rubber tubes wrong, and the vacuum pump was sucking the liquid chemicals out of the glassware instead of removing the air and distillation by-products like it was supposed to. Mr. Ivory Tower was scratching his chin and examining the situation. I quickly realized what he had done

wrong, so I spoke up “If you take this tube off and attach it here, that tube there, and this other one where the first one was, it will all work”. The teacher replied, “An interesting theory, Mr. Hennessey. Let us consider the situation”. He kept scratching his chin and considering. I got exasperated after awhile, and left the room to go smoke a cigarette or something. I returned almost a half-hour later, and he was just getting around to making the changes I had suggested. He was a good teacher of theory though – things like the electron orbitals s,p,d, and f still rattle around in my brain.

My second semester Organic Chemistry teacher had spent his career as a research chemist at the National Institutes of Health before he retired. This was a bird of a different feather. We started one experiment, but no one could get it to work. The teacher told us that we were doomed to failure because our apparati were losing too much heat. He told us to shut down our experiments and gather around one station where we would try to make it work. First, he got four students holding Bunsen burners to “heat the heck out of the thing”, and we did. Still, it wouldn’t work. He got more students to get wet paper towels, and wrap them around the distillation column with rubber bands. The experiment was starting to “go”. But the wet paper towels dried out from the heat of the four Bunsen burners, and soon burst into flame.

One student ran and grabbed a fire extinguisher. The teacher rebuked him sharply for his efforts, “Get that thing away from here – do you want to ruin the experiment?” We snuffed out the flames with wet rags, and re-wrapped the columns with new wet paper towels. But this time, he had us wrap the towels with aluminum foil so they wouldn’t catch flame. Of course the towels did catch fire, but he instructed us to just “blow out the flames” with our breaths. “More heat”, he cried. “More wet towels”. “More foil”. Flames shot out of the apparatus. Smoke filled the room. Students scrambled to blow out the flames and replace the burning towels. Finally, a wondrous sight appeared amidst this conflagration - the distillate started fractioning. An ounce of whatever chemical dripped down into the receiving beaker. Victory was ours.

During another lab session, we had a particularly boring experiment. I noticed there was a big jar full of cinnamic acid in the room, so I decided to invent my own experiment. In my lab notes, I wrote up the reduction reaction I would attempt to achieve,

assembled the apparatus and required reagents, and began my experiment. It took a couple hours, but I succeeded in reducing cinnamic acid to cinnamaldehyde. I washed off a glass rod, stuck it in my beaker, and touched it to my tongue. Yummy! I tried to convince other students to give my experiment the taste test, but for some reason, they were reluctant to do so.

The professor noticed all this activity, and asked me what I was doing. I showed him my lab notes. After reviewing my notes, he picked up the glass rod and touched it to his tongue. "Excellent," he agreed. Soon, the other students were sampling the fruits of my labors.

What do cinnamon buns, BigRed<sup>®</sup> gum and French toast have in common? Cinnamaldehyde. Oil of cinnamon is about 90% cinnamaldehyde, which gives cinnamon its characteristic flavor and odor.

The professor informed me that since this was not the assigned experiment, I would have to do an extraordinary job of writing up my lab notes if I wanted to get credit. I received an A+.