

The Lonely Struggle of the Long Distance Shimmer

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The secret to shimming an NMR spectrometer is not to let your mind wander. The mind can play tricks on even an experienced shimmer.

He remembered the time he had shimmed for 30 hours almost without break. After the 25th hour he had started to hallucinate. As he watched it, the modern superconducting magnet had regressed in time, slowly transforming before his eyes into a water-cooled electromagnet of two decades ago. The Fourier transforms had reverted to continuous waves, and the mouse with which he continued to work at the shims even as his mind lost contact with reality, transformed into five digital shaft encoders and then into a dozen primitive potentiometers. He remembered the very early days when he had used a sledgehammer to hammer metal shims into the pole faces of the steam driven NMR spectrometers. His mind drifted back to the days before he had been allowed to sit at the console of the sole NMR spectrometer, to the long days and nights he had spent stripped to the waist, his sweat commingling with the coal dust as he laboured to feed the furnace that powered the dark, satanic spectrometer. They had been hard times. He had served an apprenticeship of ten years in the boiler room before being promoted to spectroscopist 3rd class. How his heart had filled with pride when he had been admitted into the secret and sacred order of Spectroscopists Templar. It had taken years of study and meditation to fully comprehend the significance of some of their mystic rites. Their aprons had taken some getting used to, and the yodelling had seemed strange to him at first. Then one day in a peyote induced dream he had met his Spirit Guide, a hamster named Mostly Norman, and all had been revealed to him. The extra shilling a year that came with his new rank had allowed him to put a deposit on two sausages for his parents' Christmas present. His father had chastised him for being reckless with his money, but he could not hide the pride in his son's achievement. He remembered the arrival of the first Fourier transform spectrometer and how his muscles had ached from pulling the lever that worked the clockwork gears of its transform engine. It was then that he had met Lenore. Her voice rang with the clarity of an undamped sine wave. Her hair was as black as the coal he had once shovelled. Her eyes were as red as the flames at the heart of the furnace.

In those days spectrometers were tough. NMR samples were packed into clay pots before being rammed into the magnet by six strong men. Not like the delicate nancy-boy instruments of today! He remembered the reason he was now shimming. An NMR tube had dropped into the probe too quickly and broken. The usual solution was to remove the probe, tip out the pieces of broken tube, wash it in isopropanol and replace it in the magnet. Usually only a cursory adjustment to the shims was needed after this procedure. This time however, fragments of NMR tube had become lodged in the probe, necessitating its disassembly. The cover of an NMR probe is held in place by 15 screws. After these are removed, a steady hand is required to withdraw the detonator and self destruct charge which the manufacturers always fit to probes in order to protect their design secrets from casual probe disassemblers. He had once almost lost a finger trying to disarm a probe.

The heart of the probe is the two saddle coils. In older probes the coils are merely bonded to glass tubes, but in modern probes the tubes are replaced by an arrangement of hollow glass rods a millimetre in diameter forming two concentric circles something like Stonehenge, and some

would say with similar mystical properties. He had needed his microsurgery tools to extract two minute shards of glass that had become trapped between the rows of glass columns.

He looked around the room and waited for his eyes to focus. The second secret for successful shimming: when you have not been paying attention for the last ten minutes, run a spectrum and hope that by some fluke the resolution is better than you dared hope. He looked at the screen, hoping for a single sharp line. That pure Lorentzian lineshape, the proof that he had the Right Stuff. The badge of honour aspired to by every spectroscopist. The stuff that dreams are made of. He waited as the Fourier's were transformed. The spectrum was displayed... A wave of nausea and self-loathing washed over him. How could any decent person who wished to be considered a part of polite society produce such a lineshape? It was a horribly misshapen line. He looked at it and could only wonder if there was indeed a God, how He could suffer such an abomination of a lineshape to exist. It had a grotesque hump on one side that so distorted what should have been a clean, pure, wholesome single line that it almost appeared like a doublet. The line seemed to stare at him out of the glassy monitor, and he returned its stare with a wide and immense stare embracing, condemning, loathing all he saw. Without consciously willing it, he cried out twice, a cry that was no more than a breath: "The horror! The horror!"

He closed his eyes in disgust and typed 's', more to erase the image of the line from the screen than to restart the shimming. A hump on the side. That meant an adjustment of the Z4 shim was required. He reduced the value of the Z4 shim by 200, hardening his heart to a drop in the lock level so severe that he almost lost lock. Now began the task of readjusting Z1, Z2 and Z3 to compensate for the change in Z4, hoping that by the time he finished the lock level would be higher than before. Hoping that it would yield a lineshape that he could show his friends and relatives without his cheeks burning with shame. Hoping for a lineshape that would cause him to be lionized in the NMR community, that would gain him entrée into the elite social circles of the top gun shimmers. Like a character in a Yukio Mishima novel, he felt omens of glory knifing toward him like a shark in the darkly leaping sea. His nostrils flared as the shim level rose to new heights.

He had been dreaming of glory. Somehow the shims had improved. Time to run another spectrum. He wiped a bead of sweat from his brow as the time domain transformed into the frequency domain. Was this the sum of his life? Eighty-odd years of time stretching back into the past and forward into the future, only to be transformed into a resonance in some cosmic spectrum? The Fourier transform was complete. The spectrum was displayed on the screen... and he felt the gorge rising in his throat. Another hump on the side of the peak. The kind of hump that wore a bag over its head and shouted to the world "I am not an animal!" The kind of hump that awakes from twenty centuries of stony sleep and slouches like some rough beast towards Bethlehem to be born. He threw back the chair and paced around the room. He felt that tears of frustration threatened to splash down his burning cheeks, and had to remind himself that men don't cry. He was a can-do kinda guy. A guy with the Right Stuff. He pulled out a hip flask and took a gulp of brandy to steady his nerves. He must try to remain detached. He mustn't let it get to him. He knew of a shimmer who had succumbed to the lure of the perfect lineshape. For the Lorentzian line is a temptress, a seductress who can lure men to their doom. He remembered his friend who had been dragged from the spectrometer, babbling incoherently about linewidths and humps on the side. It had done something to his brain. The poor bastard was doomed to spend the rest of his days in an asylum. Even today, cries of "Shim, you hag from hell!" could be heard from his cell as he cursed an imaginary spectrometer.

He returned to the console and gave the Z4 shim another lock-level-defying adjustment. Surely this time he would achieve the perfect lineshape. How could he not? How could he... unless... unless this poor resolution was not a natural phenomenon. What if this poor resolution, this hellish hump, this eldrich distortion was not of this world at all? He involuntarily drew back from the spectrometer, now sensing that it was inhabited by an Unclean Spirit, an abomination from another dimension. Something that had infested the spectrometer during that brief period between the end of the pulse and the acquisition of the first data point - the Dead Time! No, no, that was too improbable even for him to contemplate. But there were other, more plausible theories. Perhaps it was part of a grand conspiracy, a monumental cover-up perpetrated on the Australian people by immensely powerful individuals whose identities had been hidden from the public for decades. He glanced toward the bench where the largest fragment of the NMR tube still lay. It still contained a few drops of the NMR sample. He would get it analysed in secret, but he knew what they would find. Alien DNA! He must be careful not to let the sample fall into the wrong hands. He must trust no-one. His red haired colleague walked into the room and asked him how it was going. Disturbed from his reverie he grunted at her and returned to his shimming. He tried to concentrate.

He closed his eyes and reached out with his mind to his Spirit Guide. The drums hammered in his brain until in his fevered state he felt the spirit of the hamster take control. His mind became a clear pool. At last his thoughts focussed. He had learned to recognise these rare lucid periods and to take advantage of them. He shimmed like a man possessed. He shimmed as he had never shum before. He shimmed until blisters formed on his shimming fingers and the muscles in his hand went into spasm. He shimmed with the shimmingness of the shimmingest shimmer who had ever shimmed. With the last of his strength he reached out, weak and weary, and typed ga. Slowly, slowly, the spectrum acquired. Beads of perspiration formed on his brow as he struggled to remain conscious during the Fourier transform. The spectrum was displayed on the screen. A single line. Only that and nothing more. Exquisite in its perfection. He had ridden that damned Z4 shim from one end of the shimming universe to the other, and he had prevailed. He saved the shims and walked out of the room, his head held high.