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## **Daggers of the Mind**

Arthur P. Sullivan

*Touro College*, [asullivan75004@gmail.com](mailto:asullivan75004@gmail.com)

Mary E. Houghtaling

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# Daggers of the Mind by Arthur P. Sullivan and Mary E. Houghtaling

The call from McGann surprised me. I had just settled into my apartment in Paris for the summer, and we had not been in contact for close to ten years. The lapse of time was not caused by disagreement, distance, or diverging interests. It had just happened. Each of us remained busy at remarkably similar projects, but meeting only when we had something to say, or some issue to be explored. When we did meet, we resumed conversations as if no time had elapsed at all.

I knew McGann from our earliest years. It is fair to say he is an acquired taste. His impatience, prickly disposition and sudden outbursts with throwing of objects (a signature “McGann” move), kept his count of close friends small. We attended the same grade school, where he achieved top honors every month. It was a grammar school from a bygone era, run by a religious order of men with demanding academic standards, ever ready to literally beat education into the boys they admitted.

The sheer violence of the brothers, as the religious men that staffed the schools were known, had predictable results. The boys who bore the brunt of the punishment because of poor academic work or misbehavior learned very quickly the three c’s: copy, comply or conceal. Very few of these did not comply, or laughed at the articles of faith that so clearly shaped the brothers’ lives. School life, for these few, was particularly heinous. McGann was not among any of these unfortunates.

McGann found a separate path. His excellent academic work inclined the brothers toward him, but he inexplicably called them out on absurd points of religious doctrine, standing his ground during the beating that ensued. I feel a pang even now, as I recall instances where I agreed with McGann, but could not bring myself to join in his protest.

We went to the same high school after graduation, and often travelled together to its Manhattan location from the outer borough where we both lived. Boys were admitted to this school on the basis of aptitude testing alone, and I expected McGann to have finally found his niche, as he turned to the study and mastery of chess. He had arrived in elementary school as an adept player, and our almost daily games for five or six years were only against each other and the occasional adult who was apparently entertained by losing to young kids. Once he began reading books on chess strategy, his play became too demanding and skillful for me. I mention his pursuit of chess in high school because I later realized he knew, even then, how the endgame would turn out.

Our high school was focused on the humanities to the near exclusion of the sciences, except for math, which both cultures claim. While many of us studied the sciences during summer breaks, McGann showed no interest in them. His focus on arts and letters increased steadily and he went to college at McGill as a philosophy major.

We were less in contact then but only for a year, as my path lead to a college where math and chemistry studies were mixed with humanities, so I cannot say for sure what changed. When we reconnected, McGann was entranced by cognition, and I can only assume epistemology triggered it. It was about that time that ELIZA was programmed.

ELIZA was a computer program created during the advent of electronic computing. It was an automated psychotherapist. With no human participation, a patient could interact with the program and theoretically make mental health gains. It was created by a renowned scientist at MIT, but we knew we could do better than this. McGann and I scoffed at the simple code and list processing. Intelligence, arrogance, a sense of smugness that comes with youth; whatever it was, it took me fully fifty years before I actually stopped to admire the ingenuity of the list handling and Fortran modifications needed to build ELIZA, and the even more clever choice of the therapy methods of Carl Rogers which fit the capabilities of the computers of that time far better than other therapy methods would have.

And it was not just ELIZA. Alan Turing focused computer scientists on building an artificial intelligence, a computer, which users could not tell wasn't a living person when they communicated with it. ELIZA was hailed as the first intelligent computer to meet this standard. We mocked that, too. In our view anyone at all, with no expertise whatsoever, could tell this was a machine. But we heard the support staff at MIT was using ELIZA to explore and perhaps resolve their own worries and maladjustments, and that caught McGann's attention. These users knew perfectly well that this was a programmed computer but were still satisfied with psychotherapy it provided. McGann saw the opening-a strategic fusion of humanities with science.

McGann had finally found a substitute for chess, one that would allow him to practice the moves he cherished in real life. He knew, of course, that all psychotherapy is cognitive learning. Behavior is certainly controlled by reinforcers and motivated by emotions, but reinforcers and emotions are controlled by the cognitions. Various psychotherapeutic schools teach specific methods to effect management of cognitions. McGann, the adjudicator of this "game," set these approaches aside to work with cognitive change at its two extremes, the whole experiences which cause patients distress, and the individual words they use to shape their experiences.

McGann's approach was to solve problems at the extremes and cover the middle ground by tapering from one to the other. At one extreme: An elderly person in despair because she has achieved nothing in her life, never

held a decent job, never bore a child, never had a family, never pursued interesting avocations, can have her whole experience changed. Through the exploration of her life with her, she can be shown that she has done no harm, and, in doing so, has achieved the high standard of the medical profession, “first, to do no harm”. This method works quickly.

At the other extreme: modifying the words the patient uses to describe her distress makes available the very words which both cause the distress, and govern its intensity. These can be modified singly. The process is a bit more time consuming, but each changed word the patient accepts adjusts the problem until relief is felt.

McGann set to work. Thinking, problem solving and investigating are pivotal for McGann – not only do they make him feel alive, these are areas in which he thrives. For him, they could never be replaced by anything – not sports, parties, friends, dating, marriage, family – that enhances the life of the average person. He seemed to experience more concentrated pleasure from these intellectual achievements than he could expect from all the rest combined. So though our meetings were fewer, they were more stimulating than ever. By the time he brought a problem to the table it had already resisted almost any conceivable solution.

Three years passed, during which McGann completed his bachelor’s degree and began his doctoral study. When we met, it was in Montreal. McGann launched immediately into input problems for the robotic therapist. He had already solved the problems of discovering the patient’s complaints, of creating a therapeutic relationship, and of doing a full psychiatric exam. We both knew these parts were easy, and McGann didn’t take much of a bow for having done them. The process is a series of questions, and the answers are referenced against a data file. A therapeutic relationship is a byproduct of the process: people tell their closest friends and relatives the finest details about their lives and experiences. Illogically, but usefully, when a person tells a therapist important things about themselves and their experiences in fine detail, from that point forward they experience the therapist as emotionally close as their closest friends and relations. This is the very heart of the therapeutic relationship.

The real input problem was the patient’s own uncharted narration of her distress, not her responses to structured questions.

By four am, we had migrated from a club to a café, to another café, then to an all-night diner as each save the last reached closing time. But we had mapped a possible input method which aggregated broadly related words into groups, then defined preliminary associations among the groups. This design would allow the robot therapist to group similar input and connect it to a skein of related responses along a number of previously successful pathways which led to patient improvement. The path was benchmarked at each branch by confirmatory questions posed to the patient, and success was defined by patient report of relief.

For now, McGann would have to settle for a robot that could handle input from a patient correctly, but not in a very nuanced manner. Nuance would have to come later, and he exhibited patience and planning as he moved each piece into place.

We parted, as always, with no fixed next meeting. We were both pleased with the progress made, though I admit I was left with an uneasy feeling. McGann's expressed pleasure was not fully proportional to the progress made so far, suggesting scope creep. What had occupied McGann for several years now felt more like a step to some further, unstated goal. I was leery; this adept chess player could not possibly be satisfied with a quick unchallenging win.

We met again 10 months later. McGann had accomplished the task of listing grammatical structures and their features. He had assembled lists of words suitable for substitution in reflected patient statements. Using the law of comparative judgment and psychophysical scaling methods he had ordered and proportionally spaced the words on the lists from least to most on their salient characteristic. In addition, he created an analog to a PID controller to make the most effective substitutions in the shortest time.

The essence of cognitive therapy is substituting the units of thought, words and phrases, softening or eliminating similes and metaphors, grounding the patient in the bare bones of the problem to be solved instead of a catastrophic version of it. McGann arranged a way to move the optimal distance toward relief in every response to the patient. He wanted flawless moves executed by the bloodless therapist in the psychological chess match in which patient and robot were embroiled.

We had programmed the robot with the methods for adopting words from the patient's input, modifying them, altering the grammatical structure that was their setting, and expressing the healing thought to the patient. It was time. We were ready for live testing with informed volunteers. McGann was satisfied that his robot therapist had met the Turing criterion, not that that mattered in his view. And he was confident that therapeutic gains could be achieved, documented, and confirmed by the patient in minimal time. Other advantages he ignored, including robot availability 24/7, nominal cost of treatment, perfect execution of safety procedures, relentless unconditional positive regard toward the patient, and, well, the list goes on.

And yet, he wasn't satisfied. McGann flatly stated that the robot didn't understand the patient. All was process and performance and protocol; nothing was truly learned or understood by the robot. Feeling understood is a therapeutic force, and the patient would feel understood, and so would improve. But it wasn't real. The robot understood nothing. The scope creep was monumental. He now wanted to go further than I imagined.

It was well past dawn and near lunchtime the following day before we called it quits. We mapped and remapped the entire project. We reviewed every process, more narrowly placing similar words, concepts, grammatical structures into virtual baskets, and linking the baskets with multiple principles of linguistic, mental health and scientific knowledge. Every interaction, every sentence would start with the patient's input broken down into word and structure elements. Then the baskets containing those words and structures became the starting point. At the speed of light and electricity, the robot would trace every path among those baskets, and every path leading from each of those baskets through any number of intermediary additional baskets to the final baskets that contained improved outcomes for this particular patient's difficulties.

Changes would be selected initially from baskets in the path with the highest past probability of success, with optimal choices of words from each basket being made with the PID-inspired controller. The result would be expressed to the patient. The effect on the patient would be found in the patient's reply, but, if unclear, concretized with a direct question. The results would be added to the data base and success probabilities recalculated for all paths. This procedure would re-occur with every interchange with every patient, every sentence or two, all within milliseconds.

McGann was unhappy with the plan and blatantly said so. We had designed a robot with understanding's counterfeit, but not understanding itself. McGann said, and meant every word, that from this he readily inferred that we knew nothing of understanding or thought itself. A chasm still separated us from the goal. But the difficulties and intricacies of the task we had just outlined drew his attention away this fingerfehler, as I knew it would. We lunched quickly and parted, he to his task, I to mine.

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I waited in a small Paris club in the 5th, facing the door rather than the small stage. McGann and I had met here before, and in dozens of other places on three continents over nearly sixty years. Each evening French singers at the very beginning or near the end of their careers sang in this club for a mix of Parisians and tourists during the evening's dining and drinking hours. This atmosphere provided a restful interlude between our intense discussions of the afternoons and those of the late nights into early next mornings. It was three in the afternoon so the club was nearly empty. McGann was ever punctual, so when four o'clock arrived with no sign of him, I dialed his number. My call went directly to his voicemail. At ten before five I watched a courier enter, find the maître d', who promptly sent him in my direction. I opened the envelope he delivered with wordless apprehension.

"The supposedly good new first: The robot worked well in lab tests, then subsequently with volunteers and finally with patients. Health insurers in the US are picking it up primarily to realize cost savings, no doubt, and

you will, no doubt on this either, be contacted and offered regal sums if you have the stomach to accept them or any earthly use for them. They are asking for refinements, and the path forward from our fifty-odd thousand groupings plus what we feared would be infinite associations is unchallenging. Suspension of pathways with zero or near zero probability of effecting healing of the patient brought the number down to manageable size.

“My total failure, and yours, if you haven’t realized it already, is the bad news, in whatever sense anything can be called good or bad any more. As tests results piled up it was clear that the robot mimicked understanding in every explored way. In the end, the only possible conclusion is that we have duplicated understanding exactly. I am speaking as a trained philosopher now, a subject in which you have done pathetically little studying (I could hear McGann’s voice in the written words as if he were sitting there with me). Obviously, if robot understanding duplicates ours, then ours is no more than the robot’s. My lifetime spent in the corridors of the mind would have been better spent growing strawberries. This applies to you, too (ahhh, McGann). Pick your poison, regret or chagrin. Enjoy the irony.”

Rain in Paris is often refreshing. Deluges are rare, and it can be pleasant to walk in the rain there without imper or parapluié. But the light rain was cold when I finally left the club.

Two years have passed. McGann has not answered his cell, nor email. His university colleagues have not seen him nor heard from him. He has no living relative. In spite of truly diligent search, I have found no reference to him of recent date, not even the ever-feared obit.

When awake at vulnerable hours, I picture the insensible but effective robot working in the clinics, the adept McGann at positional play while I try to make some restful sleep possible in the remaining time until dawn. Waiting postpones despair. Years often passed between our meetings.

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**Arthur Sullivan, Ph.D.**, (père) a Psychologist and writer, is Professor of Psychology and Education at Touro College and University System. Previous publications are largely academic articles, plus several short fiction pieces and a poem in Vidya.

**Mary Houghtaling**, (fille) an English teacher at Kittatinny Regional, is part-time Professor of English at Montclair State College.