CARNEGIE TECH IN THE FIFTIES

by Arnold Wasserman
January, 2010

These are reflections on my years 1952 through 1956 at Carnegie Tech as a Painting & Design student majoring in Industrial Design.

“The sacred grove beloved of the arts and muses”

I arrived at Tech in 1952 from a small Pennsylvania Dutch farm town. For the first time in my life I felt I was where I belonged, surrounded by people doing ART. I was a Painting and Design major in the Fine Arts building, a white marble layer-cake of the Beaux Arts.

In the basement were the sculpture studio and the drama department’s studios for building sets and making costumes. On the main floor, along with administrative offices, were a small exhibition space and The Little Theatre, about which more later. Music practice studios occupied the mezzanine. Above that were the ranks of long drafting tables of the architecture department. At the top was painting and design, surmounted by the skylighted loge housing the teachers’ studios, a long open space where student work was hung for year-end jurying and, at each end, a warren of semi-private alcoves for the senior painting majors.

The place echoed with art. There was the constant background tootle and strum of music students in their practice rooms. The halls rang

with the orotund tones of dramats (drama students) rrrrooouuuundly proclaiming their lines and clanged with stage fencing practice up and down the worn marble stairs.

I was here only because I had received a full-tuition scholarship, as have so many fortunate students since Andrew Carnegie first established Carnegie Tech in 1900 to provide technical education for the children of his mill workers.

This still left me with the problem of where to find money for food and lodging.

The fraternity

My sophomore year I was initiated into Beta Sigma Rho fraternity, the "Jewish" fraternity. Most Beta Sigs were arts or drama students or science and math majors. The fraternity officers were all future Masters of the Universe from architecture, business administration or printing management. I was accepted not for my social graces or stylish college wardrobe, which consisted of two pairs of dungarees (that's what jeans were called in those days), one paint-spattered and the other … cleaner. What I had were good grades.

In exchange for my grades, waiting tables and doing drawings for the guest book for Saturday night parties, the fraternity gave me a full room and board scholarship.

Another fraternity perk was that the fraternity house, an Adams-family-like gray stone pile, sat high on a hill directly across from Morewood Gardens, the womens' dorm. The dramats always practiced their fencing in front of the house, accompanied by lots of A-HAA! sound effects and cheered on by handkerchief-waving Morewood women leaning fetchingly from the windows. I immediately took up fencing. Eventually, the Beta Sig drama students formed a Tech fencing team, which I joined. We never won a match. But that was hardly the point.

The lucky kids got to live on the top floor of the fraternity house, where the rooms had dormer windows looking out on treetop views. Design and architecture students vied for one room that had an

adjoining studio with a huge drafting table hung from the wall. That was my home in my junior and senior years.

The job of the smart students was to keep the fraternity grade average up while the other brothers were down in the odiferous basement swilling watery keg beer, locked in sweaty embrace with their Morewood Garden dates.

My roommate was Percy Chuck, a Chinese math major from Jamaica (Jamaica had a large population of refugees from the Chinese Communist takeover.) As one of the few foreign students on campus, a track star and a good-looking girl magnet, Percy had exotic cachet, some of which I hoped, in vain, would rub off on me as his roommate.

Across the hall were Ed Feigenbaum and Bob Englemore, the intellectual sophisticates of the house. They were from New York. They smoked pipes. They wore tweed jackets with leather elbow patches (maybe not elbow patches, but that's how I remember it). Classical music wafted day and night through the transom above their always-closed door. On rare occasion I was admitted to the sanctum sanctorum, where Bob would be sprawled in a chair *reading the conductor's score* for the symphony playing on the phonograph.

Nobody understood what Ed and Bob studied. It had something to do with science and computers. The rest of us had little idea what a computer was (we're talking 1953 here. The first commercial computer, Remington Rand's UNIVAC, introduced in 1951, first came to public attention in 1952 when Walter Cronkite announced its correct prediction of Dwight Eisenhower's election as president.)

It wasn't until 30 years later that I discovered what those urbane smarties had been up to – across the hall and on the other side of The Cut. They were inventing modern computer science and pioneering the field of Artificial Intelligence.

I'll return to this subject later, along with how it was that in the late 1980s, Ed and I reconnected as my field of design converged with his of intelligent computer systems.

“Hell with the lid off”

The thrilling thing about Carnegie Tech in the Fifties was its setting in the beating heart of American industry. I loved watching from my top floor dormer windows the black night sky flare red as molten slag was poured at steel mills in East McKeesport and North Braddock and Duquesne.

This was still the Pittsburgh of industrial legend, of smoke, steam, gritty soot and darkness at noon. It was not that different from the town described in 1868 by Boston writer James Parton (not Charles Dickens, who often gets the credit/blame) as "hell with the lid off."

In 1927, the irrepressible H.L. Mencken devoted a complete essay, “The Libido for the Ugly,” to describing the view from his eastbound train out of Pittsburgh as “appalling desolation … intolerably bleak and forlorn … a macabre and depressing joke.” He said:

> Here was wealth beyond computation, almost beyond imagination--and here were human habitations so abominable that they would have disgraced a race of alley cats … On certain levels of the American race, indeed, there seems to be a positive libido for the ugly, as on other and less Christian levels there is a libido for the beautiful. It is impossible to put down the wallpaper that defaces the average American home of the lower middle class to mere inadvertence, or to the obscene humor of the manufacturers. Such ghastly designs, it must be obvious, give a genuine delight to a certain type of mind.

Hyperbole aside, one could hardly ask for a better call to action for the mid-twentieth-century designer. What loftier mission in life than to transform the landscape of material culture and efface “the libido for the ugly?”

My devotion to this quest was not unmixed. Escaped from the somnolent embrace of a farm town, I found “hell with the lid off” entrancing! I loved our field trips to factories to view molten steel being poured and streams of aluminum squirting out the end of an extrusion die. I loved the clamor, the heat, the smells, skillful and daring men directing tons of brute power. Maybe I too suffered a bit from Mencken’s libido for the ugly.

No less enticing were those “abominable human habitations” that so

offended Mencken's sensibilities. Up each steel mill valley lay a town of distinct ethnicity. One was German – store signs in German and German all you heard spoken on the street. Another was all Russian. Others were Polish or Lithuanian. For this rural kid who never had been outside the U.S. or heard a foreign language spoken, it was instant immersion in Mitteleuropa.

Where are you from?

There was not a single foreign student in any of my classes. About half of my classmates were Pittsburgh kids. The rest were from somewhere on the East Coast, mainly the New York City area. There were two exotic guys. One was from Texas. The other was the cool kid girls swooned over and all the other boys wanted to be – an olive-skinned Italian-American smoothie from New York with thick, wavy, dark blond hair and bedroom eyes whose name was, no kidding, Dino Savio. More infuriating, Dino was a lovely guy and an excellent artist who today is a successful painter and printmaker.

The life of the studio

To gain admission to the art school, applicants had to pass a week-long studio "technical test." I LOVED it! I had never before spent days on end in a studio doing art. I knew immediately that I had found my natural habitat. Later years as a corporate design executive stuck in office meetings among "the suits," administrative assistants hovering around us, convinced me that much that is wrong with business life could be fixed instantly if people worked in studio environments in an atelier culture.

It is no accident that in the dot.com era of the 1990s, high-tech startups all set up shop in open environments that looked and worked a lot more like collegial design studios than hierarchical business offices and that the organic studio space has become the business signifier for "collaborative innovation going on here."

Liberal arts. Not

Carnegie Tech was grounded in the idea that the purpose of education is equipping students with the high skills the labor market

requires. There was only a sidewise swipe at providing art and design students with a liberal academic education. Following graduation and after working in industrial design for seven years, three of those in Paris directing the largest design office in Europe, I realized I badly needed to fill the gaping holes in my mortarboard. I was a technological savage having no historical, epistomological or theoretical framework for what I was doing. I needed to go back to school to get a liberal arts education. I went to the University of Chicago and got a Masters in History and Theory of Design, – a non-existent major that they let me to cobble together under the guidance of a mentor.

There was one exception to the deficiency of my Tech academic education.

Astere Claeyssens

The exception was the one-semester course in English Literature taught by Professor Astere Claeyssens, who was improbable not only in name but in just about every other way. Affecting a Byronic persona, tall, lanky and handsome as a young Basil Rathbone, he could be espied striding across campus in full sail, his ankle-length black cape-coat billowing abaft.

He did not lecture, he *performed*, pacing the classroom like a captain on the deck of a galleon. He would pause momentarily to perch on a one inch edge of his desktop or balance on the chalk ledge of a blackboard, his legs drawn up, never missing a beat of his lecture, as we all sat breathless waiting for him to crash to the floor. He never did.

Claeyssens introduced me to the world of Literature and Ideas, both in capital letters. The main text of the course was Robert Penn Warren's Pulitzer Prize masterpiece, *All the King's Men*. The singular experience of deconstructing and interpreting that work under Claeyssen's guidance smacked my mind sideways from the narcissistic self-absorption of late adolescence into the adult world of acts, consequences, moral choice, responsibility and the fatal interconnectedness of all things.

I became a literature junkie for the rest of my life.

Claeyssens, bored of sharing genius with jejune art students, went on to teach English at George Washington University. He was also the producer, director, writer and star of "One to One," a series of 20 programs on literature produced for public television, for which he received an Emmy in 1969. He also wrote "Words and Music; An Introduction to American Musical Theater," published in 1982 by the National Endowment for the Humanities.

Balcomb

More typical of the quality of our academic education at Tech was the course in Art History and Aesthetics given by Balcomb Greene, a noted abstract painter whose works were collected in major museums. Greene was tall, gaunt, Lincolnesque with a huge leonine head that looked hewn out of an oak burl with a chainsaw. In those male chauvinist days it was an assumed perk for teachers to cut a worshipful young woman, or two, out of the yearly herd for private tutoring. While he deigned to teach art history, Greene refused to teach painting to young kids, who he privately thought were all idiots where art was concerned and useless for anything except supplying him with serial paramours. Our thumping boredom with the class was equaled only by Balcomb's own, his lectures delivered in a reverberating bass rumble from which only articles and conjunctions emerged intelligible:
"…rumblerumblerumbleANDrumblerumbleTHErumblerumblerumblerumbleWHICHrumblerumble...etc."

Cultural life

If my formal academic education at Tech was barely existent, the informal cultural life of the campus shaped in me a lasting devotion to art, theatre, music and the life of the mind.

The Little Theatre in the lobby of the Fine Arts building was a magic portal to the glorious cultural life of the larger world. Any given evening, I could stumble down four flights of marble stairs, flop down in paint-stained jeans and…oh my…there would be Aaron Copland and Isaac Stern playing Copland's chamber compositions! Or Stravinsky's *L'Histoire du Soldat* with an ensemble from the Pittsburgh Symphony conducted By William Steinberg, the soldier

and Satan played by then drama students George Peppard and Bill Ball! Or a drama department Master's performance of Shakespeare's *The Tempest*! All free!

What a gift. What a gift.

Pittsburgh beyond the campus offered further cultural riches. Tech students could buy tickets to Pittsburgh Symphony concerts for, I think it was, $3.00. A princely sum for me, I could afford it only when I got paid for a piece of sculpture or an illustration or calligraphy.

Pittsburgh was a convenient half-way stop for jazz musicians traveling by car or bus between New York, Detroit and Chicago. I could nurse a $1.50 beer all night long at the Carousel lounge, a jazz hangout in a downtown alley. It was the width and length of a railroad car, with black walls, floor and ceiling and circus characters in garish fluorescent paint, lit with black light that made your teeth and fingernails fluoresce white. Bench seats along one wall faced a miniscule red-spot-lit stage regularly occupied by the best jazz musicians then playing in America, including Dave Brubeck, The Modern Jazz Quartet, Max Roach and Sonny Rollins, The Australian Jazz Quartet, Lee Konitz, Thelonius Monk, Marian McPartland, and many more.

Bucky

In my junior year, I chanced by the Little Gallery and discovered a gnomish little man in shirt sleeves and tie bustling over a room-full of beautiful geometric objects unlike anything I had ever seen. What's happening here, I asked. I am R. Buckminster Fuller, he said, and these are my geodesic, tensegrity, tension-compression and dymaxion structures. That night he lectured to a packed room for 6 hours straight without pausing to take a breath – in an original agglutinated language as hypnotic as his roomful of stick-and-string constructions.

This was my first encounter with theory-driven design, my earliest inkling that design could be about systematic intellectual rigor and cognitive strategy, not just subjective, intuitive, personal, formal sensibility.

Industrial Design

I assumed I would become a painter or illustrator or graphic designer. But in my sophomore year, I discovered the sculpture studio. I started spending all my free time there and so fell in love with forged and welded metal sculpture that I neglected other classes and had to be admonished by the Dean that I would lose my scholarship if I didn't shape up.

At the end of our sophomore year when we had to choose our major subject I agonized between painting and sculpture. One day I saw a student carrying something down the hall that looked like a shiny, brightly colored piece of sculpture. I said what is that. He said that's Industrial Design. I sought out Professor Robert Lepper to find out more about industrial design. We met in his studio in the loge. After a delightful, long, rambling conversation I knew no more about industrial design but I was fascinated by the sculptures he was doing on commission from Alcoa Aluminum Company, brazing together diagonally sliced and routed lengths of extruded aluminum tubing. I left convinced that industrial design was about sculpture using industrial materials. Cool! I signed up to major in industrial design.

What I did not learn at Tech about industrial design was any of the structured design methodology, techniques or tools that are core to design practice today; i.e.: rapid visualization, rendering, aesthetics, 3-dimensional form, rapid prototyping, progressive assessment, engineering, business, design history, design philosophy, design theory, design thinking, design strategy, design planning, design management, human-centered innovation, innovation strategy, team collaboration, interdisciplinarity, co-design, integrated product development, ergonomics/human factors, design research, contextual inquiry, ethnography, persona-based scenarios, experience design, design for manufacturability, design for assembly, design for recyclability or sustainable design!

Needless to say, nobody in design was yet involved in user- interface design or human-computer interaction design. The first commercial products with programmable intelligence and software-driven user interfaces were only just appearing at that moment. The first solid state electronics product, a Texas Instrument radio, appeared on the market in 1954 and the first fully transistorized computer in 1955.

What I did learn in two years at Tech about industrial design makes a very short list. I learned mechanical drawing and a smattering about industrial materials and processes. I learned how to make simple stuff in a machine shop.

When I graduated, my design portfolio was pitiful. Even though my graduation project had been featured in *Industrial Design* magazine, I lacked basic entry-level design skills. I had, however, done a lot of summer and free-lance work in graphics, illustration, exhibit design and typographic design. That is what got me a job at Peter Muller-Munk's design office in Pittsburgh. Peter had been head of Tech's industrial design program from 1935 to 1944, following its founder, Donald Dohner. Peter gave me extraordinary opportunities to work on major design projects where I quickly came to understand that the most important thing I had learned at Tech was…*reflective thinking!*

I had learned habits of mind that shaped the rest of my life. The source was Bob Lepper, who taught thinking under the guise of teaching design. Lepper's practice of the studio critique became, for me, a portal to the thought of Kant, Dewey, James, Wittgenstein and Habermas.

Lepper

Robert Lepper was a Gioccametti drawing of a man, tall and stooped, all angles, elbows and knees. He stared out at us in myopic amusement through thick round glasses that made his eyes look like olives in the bottom of a pair of martinis. His cackling laugh flapped his entire body like a rag doll. From top to bottom he was the color of tobacco stain – from shoes, vested tweed suit, papery skin, floppy hair, scraggly moustache and elongated teeth to long, lop-knuckled fingers perpetually terminating in a half-smoked cigarette.

The Crit

Lepper's chief pedagogical instrument was that half-smoked cigarette. He sat perched on a stool, skinny legs and arms encoiled like a DNA helix, out of which rose a bony forearm, fingers and the half-smoked cigarette. As he gave problems or conducted crits, the ash on that cigarette fixated our attention. It grew longer and longer, at about ¾ of an inch began to droop and finally fell onto his jacket

and trousers. I can't remember ever seeing him light a whole new cigarette.

The design problems he gave were open and general. There was no prescribed method of approach, no criteria for a "good" solution, only a vague notion of what final deliverables needed to be.

The locus of Lepper's method was the crit – inductive argumentation conducted as recursive dialogue. Given a student's concrete proposition, Lepper would lead the student by indirection to examine the backward chain of his premises and conclusions.

He was working to inculcate the meta-processes of reflective practice, the notion that one could have a cognitive strategy for knowing what you know. But he never used any such language or tried to make explicit what he was trying to do. You got it or you didn't.

It made everybody's head hurt. It drove the more concrete-minded or intuition-driven students crazy. Likewise those who preferred clear structure. For me it was a revelation. Lepper's crits planted the seeds for my later career interests in the epistemological questions of stochastic discovery, messy and wicked problems, thinking about thinking, knowledge about knowledge and designing design.

Thank you

For many years after I graduated I regularly visited Professor Lepper – I never addressed him any other way – to take him to dinner and discuss design, life, the universe and everything. Those were treasured encounters. By the late 1980s, his health was failing. The half-smoked cigarettes had caught up. He had emphysema and was tethered to an oxygen tank.

A group of his graduates put together a celebration to honor him. He asked that I deliver the formal presentation, which I did. I also told this story: It was the occasion of a final crit for a project we had been working on for many weeks. I had just finished an elaborate, brilliant defense of my perfectly awful design of a bicycle headlamp. It was an obvious rip-off of the rear end of a 1956 Chevy Bel Air. Lepper was silent for a long time. The ash on the half-smoked cigarette drooped.

Finally, in his slow southern-Pennsylvania drawl, Lepper said: “Meestor Wassormen, as a designor, you would make a great lawyor.” I did not at the time recognize this as a serious piece of career counseling.

Heuristics

During crits, Lepper often used the term "heuristics." None of us knew what he meant by that and he never bothered to define it. We thought we would look stupid if we asked. It took me 30 years to understand that heuristic means exploring possibilities through trial-and-error iteration instead of following set rules. A heuristic is a speculative method, often using rules-of-thumb and trial-and-error for finding out, investigating, learning or discovering a solution to a problem. From the point of view of problem solving, a heuristic is a fact about the world that can be used to reduce search through a mass of knowledge. As Ed Feigenbaum would later put it: “Heuristic reasoning is the art of good guessing.”

Heuristic has another, less common meaning. It is a method of teaching that encourages students to learn things for themselves, to make discoveries through their own investigations. This was Lepper’s method.

The Other Side of The Cut

Just across The Cut was the recently formed GSIA, a new kind of business school funded by a big Ford Foundation grant. A lot of thinking about heuristics and design thinking was going on over there, too, but we knew nothing about it. It was based in the still-emergent field of computer science and the embryonic field of artificial intelligence.

One of the few people in the Fine Arts building who had any awareness of what was going on at GSIA was Bob Lepper. And he did not like it.

The Thinking Machine

I became accustomed to hanging out in Lepper’s studio whenever I could. I remember the day he came back from a conversation at

GSIA with a certain Professor Herbert A. Simon. Lepper was steamed. They think they can build a machine that can think creatively like a human being, he said. Lepper thought it was not only impossible to reduce creativity to algorithms but perverse and maybe immoral.

Not until thirty years later did I discover that Herb Simon, 1978 Nobel laureate in economics for research on decision-making in organizations, was the mentor of my fraternity brother, Ed Feigenbaum. Simon and Ed along with Alan Newell and a handful of other geniuses were over there inventing the field of artificial intelligence that so offended Lepper.

Lepper did not understand that Simon was developing “thinking machines” as a tool in a much broader quest, which was, as Simon put it in his autobiography:

> To work for the ‘hardening’ of the social sciences so that they will be better equipped with the tools they need for their difficult research tasks; and to work for close relations between natural scientists and social scientists so that they can jointly contribute their special knowledge and skills to those many complex questions of public policy that call for both kinds of wisdom.

The goal of the new GSIA was to place business education on a foundation of fundamental studies in economics and behavioral science. In 1954, Tech got its first computer. Simon and his colleague Allen Newell conceived the idea that the right way to study problem-solving was to simulate it with computer programs. Computer simulation of human cognition became Simon’s central research interest.

A new field of science was coming into being. Ed Feigenbaum, then an Electrical Engineering student, was drawn into the circle that was rapidly aggregating around the intersection of computer science, information technology and behavioral science.

Recently, Ed sat down with me to reminisce about his experience of that pivotal period around 1955. He says that it was the fullest enactment to that time of the principles of The Carnegie Plan: an ethos of tolerance, openness, flexibility and broad interdisciplinarity; a focus on thinking about learning and a practice of mixing and matching individuals’ interests and skills with the capabilities of the

school; all in service of a goal to have the arts and humanities and sciences share a common model of creativity.

As to Simon's pedagogy, there wasn't any. There weren't courses. It was somebody saying: oh, here's a problem, let's go look at this problem. The professors and students would work together on that problem. While still an undergraduate, Ed co-authored seminal papers on Artificial Intelligence with Simon.

The environment was open door everywhere, everybody talks to everybody. The most valuable time, says Ed, was at the end of every day when the entire team met in the Faculty lounge from 3 to 4 PM for coffee and tea.

Why did all of this happen at Tech rather than, say, MIT? Because Tech was small enough that you didn't have to persuade a lot of people to do something. You could know everybody. One or two geniuses could make it happen. You could persuade through the power of thought. As Ed puts it: "Small with Genius beats Big."

The disciplines that came together in GSIA around what Simon then called "Systems & Communications Sciences" and later in the mid-60s became simply "Computer Science", included social science, behavioral science, economics, political science, mathematics, statistics, symbolic logic, operations research, organizational and administrative decision-making, problem-solving, activity analysis, management science and engineering.

Arts orphans

In our happy little Beaux Arts cocoon in the Fine Arts building we were orphans of the Carnegie Plan. We knew nothing about and took no part in the interdisciplinary revolution under way elsewhere on campus. That is a signal difference between design at Tech in my day and at CMU today when design is dialed in to the intellectual centers of the University.

Sixty years behind

The industrial design curriculum at Tech in the fifties was little changed from that founded by Dohner, Lepper, Muller-Munk and

Kostellow in 1934. Which in turn, was based on the Bauhaus curriculum of the 1920s. So one could fairly say that my design courses were thirty-year-old stuff. Across The Cut, Ed Feigenbaum and his mentors and colleagues were doing work that was easily thirty years ahead of the world at large. On the day I graduated, that put me, by the most generous estimate, sixty years behind Ed.

Converging with Ed

After graduating from Tech in 1956, I did not see Ed again until the late 1980s. In those intervening years our career trajectories could not have been more different. Ed's path was like an arrow. He stayed at Tech, got his PhD in 1960, went to Stanford where he became of head the Computer Science department and later established the renowned Knowledge Systems Lab. He created several companies. He wrote and co-authored seminal books and papers on Artificial Intelligence and in 1995 received The Turing Award, which is the "Nobel Prize for computing." Two years ago he retired from Stanford, where he remains emeritus professor.

My career path was like a scribble. During those thirty years I lived in 13 different places in the U.S. and France, working as a design and innovation consultant and as vice-president of design for a succession of large corporations.

When Ed and I reconnected in Palo Alto in 1989, we both were working on human-centered innovation, but in two different fields that were just discovering one another.

Ed had pioneered the building of computational models of human expertise that could in turn be applied to the invention of new solutions in, say, biochemistry or medical diagnosis or oil geology. Today, many thousands of Artificial Intelligence applications are embedded in the infrastructure of every industry and in the electronics of myriad products.

I had been a pioneer in creating experiential models of social behavior that could in turn be applied to the invention of new solutions in products, services, communications and environments and socio-technical systems. My work is now ubiquitous in design management and innovation strategy.

What surprised us was the commonality of our methodological approach:

1. Knowledge about people was at the center. We both used techniques of contextual inquiry, involving observation, task analysis, formal questionnaires and open interviews to probe the deep structure of how our subjects (in Ed's case, world class experts, and in my case, ordinary users of solutions) thought, operated and used knowledge in the world
2. We both were creating socio-technical systems intended to separate out tasks so as to let tools do what tools do best and people do what people do best.
3. Our work was intensively collaborative and interdisciplinary.
4. We both used a discovery and development process involving trial-and-error iterations of good guessing and stress testing. Designers call it concurrent product development. Computer Scientists call it spiral development.
5. This process was based on the same iterative model of design thinking that cycled between top down deduction and bottom up induction.

Design Thinking

Today Design Thinking has become a paramount theme in design theory, practice and education. Most designers believe that design thinking was created by designers and fairly recently.

In fact, design thinking was developed by Herb Simon at Carnegie Tech in the 1950s and 60s and codified in his seminal 1969 book, *The Sciences of the Artificial*, where he wrote the protocol that is recognizable to any designer today:

> The design thinking process has seven stages: define, research, ideate, prototype, choose, implement, and learn… Within these seven steps, problems can be framed, the right questions can be asked, more ideas can be created, and the best answers can be chosen… The steps aren't linear; they can occur simultaneously and can be repeated.

The Unfinished Prototype

It has taken not only the design community but the rest of the world fifty years to catch up to Design Thinking as codified by Herb Simon.

Today we apply the concept not only to industrial artifacts but to the design of systems, experiences, social programs, policies and organizations.

The connection of Simon's 7-step process to organizational behavior was described most recently by my friend Robert Sutton, a specialist in management, organizational behavior and innovation at Stanford University:

> Design Thinking happens in an organization that considers itself an unfinished prototype.[1] Design thinking is one of enlightened trial and error wherein one observes the world, identifies the patterns of behavior, generates ideas, gets feedback, repeats the process and keeps on refining.[2]

I can think of no better description of the ethos of Carnegie Tech/CMU than that of an ever-unfinished prototype.

Nor can I imagine a better visual metaphor for this idea than the façade of the Fine Arts building. It once troubled me that the entry and four arched niches looked unfinished. Each alcove appeared to be at a different level of incompletion, in a different historical style.

Today, that seems exactly right. Carnegie Tech provided the challenge, the richly diverse stimuli, the framework. It was left to the rest of us to carry on the work, to fill in the spaces.

1 Emphasis mine

2 *Hard Facts, Dangerous Half-Truths, and Total Nonsense: Profiting from Evidence-Based Management.* Jeffrey Pfeffer and Robert I. Sutton, Harvard Business School Press, 2006