TRAJECTORIES, INDIVIDUAL ABILITIES, AND SERVICE

Martin D. Gehner

With the encouragement and gracious invitation from Pat Dallai, I am honored to have this opportunity to share some thoughts about my trajectory and the joy of being included with the Koerner Center's group of colleagues. I was born in 1932, and my very modest formative years were heavily packed with emphasis on serving one another. Looking back, I remember many opportunities where my parents created and insisted on engaging in service activities as a natural part of our everyday being. In his 1965 commencement address at Oberlin, Dr. Martin Luther King, Jr., said:

> All life is interrelated, and we are all caught in an inescapable network of mutuality tied in a single garment of destiny. Whatever affects one directly, affects all indirectly. For some strange reason I can never be what I ought to be until you are what you ought to be. And you can never be what you ought to be until I am what I ought to be – this is the interrelated structure of reality.[1]

The rest of this presentation could end here and our time together could focus entirely on a discussion of the beauty of this quote and what it could mean for all of us. In fact, it could also be a topic for further discussion in another Koerner Center group.

I believe this. Ideally at least, I want to believe this. For everyone, singular achievements are lauded at a host of timely moments in life. The focus on individualism colors how we assess circumstances and perceive one another. Yet the very individualism of each person is a wonderful gift which is meaningless without sharing it to its fullest with those whom we encounter in our lives. The values associated with achievements are used for reasons usually appropriate in a context of what is needed, as together we strive toward an acceptable common purpose. Sometimes the common purpose is unacceptable for the mutual benefit of society and individuals, straining the interrelatedness. However, all people have heart and soul, and our lives can be blessed by the goodness, and abilities, of one another.

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The rural environment of my early years taught me, out of necessity, to use resources with care and efficiency. What was learned via very practical needs became a source of knowledge for creative applications for other projects—not always with stunningly new discoveries, but with useful and fun activities. The woods behind our house were an ever-changing environment, especially for an exploring young soul. One such annual ritual was to test the flexibility of ice on a melting pond, using oneself as the moving object on a runner sled, without getting wet or breaking the ice sheet. I discovered that a successful result depended on the speed of the moving object, my sled and I, with a strong propelling force required to reach the opposite shore safely. After a pretest of the ice conditions, one try was all that was possible. Another winter challenge was to take the family Christmas tree and make a sled from fan-shaped pine branches, weave them together, and use the formed fan as a vehicle for a thrilling ride down a steep, somewhat icy hill. Later, when spring arrived, the high water of local creeks became the focus for making boats from remnant barn materials. One learns about form, strength, stability, integrity of object, durability, and other everyday attributes of useful items in normal patterns of life. Perhaps these experiences were early signs of my interests in materials, their useful properties, and opportunities to make practical things.

From elementary experiences of the one-room school, and subsequently in a city school having many students, the next step to high school was less than demanding. We had about twenty to twenty-five students in each high school grade. Resources and options for study were basic and not very challenging. However, I did have the opportunity to coach a basketball team of fifth and sixth graders. Although we had oversight from a sparse number of teachers, on game day I was handed the keys to the school bus and drove our team ten miles to our challenge in the neighboring town. That experience would never be even thought of today! But that same experience taught me a level of responsibility and an intense awareness of the underlying unique talents of each player. Time for my own development of basketball skills was limited, but my defensive skills contributed to our high school team's successes.

Learning in that environment took on a flavor of practical applications. Basic core courses were easy, yet the demands on time had to include the three-mile walk from school after sports practice along with the rudimentary responsibilities at home. With three older sisters who had music lessons and interesting activities, the daily tasks were easily pushed down the corporate ladder. At that time in history, standardized school and placement tests were sparse, yet my coach guided my thoughts to follow his experience at a small liberal arts college known for attention to individual development and preparation for the next step in life.

After completing high school, I spent a year working to garner resources. A job delivering furniture was acceptable temporarily. The following year, Wittenberg College became a place to struggle and grow. My schedule soon became packed with every level of preparatory courses, which were missed in high school, plus the normal schedule of freshman courses. The academic experience was exciting, demanding, and

complemented in every way by the quality of faculty and the caring aura of the college in general. To complete the experience, working to pay my way through was essential. The college's business office was extremely generous and gave me a variety of work responsibilities ranging from night watchman for the library to weekend management of the small student union, along with many clerical tasks requiring only weekly attention. Their trust in me instilled a passion to succeed in their expectations as a small way to show my sincere appreciation for the room and board they provided. The interdependence of colleagues, faculty, and the college's leaders allowed everyone to discover new talents, expand interests, and create new visions.

By that time my independence from earlier family patterns provided a path of subsistence as well as challenges for future development. One summer was blessed with work delivering furniture combined with evening math courses. The next summer included my first experience, albeit part-time, in an architectural office. As I soon learned, that office was rather altruistic in that the architect only undertook work where he maintained a strong mutual respect for his clients and never worked under contract—the handshake was the promise to perform his very best work for every client. Needless to say, that was an impressive experience for a young person forming an idea of, and context for, the meaning of potential professional service.

Academically, my emerging talents began to combine engineering, art, math, and science. So after two years, the compelling direction was to attend architecture school in my home state of Michigan. Of course transferring into a prescribed, professional program meant more new basic courses plus the professional sequence of courses. For me, technical courses were easier than history or design. The latter was a case of my very limited background and experience. The freedom of artistic expression required new approaches to thinking, developing concepts, and freedom of motion to use graphic tools. However, learning how to translate ideas into reality was also a challenge. The use of materials, the mechanics of making, the knowledge of environmental influences, and the requirement for structural integrity demanded new modes of thinking about, and finding, solutions to architectural problems. The challenge to expand basic knowledge, develop visualization skills, theory, and substantive criteria presented by each project created tension between concepts and the practical details required in each project. The wholeness of things working together, yet each part doing what it does best, was a natural process. Such interrelatedness extends Dr. Martin Luther King's quote about people to also connect living and habitat. Individuals constantly interact with people and place, thereby creating our personal comfort zones for our respective abilities and needs.

The transition from Wittenberg to Michigan was dramatic and fulfilling. Launching from a small, friendly school into the environment of a university of 40,000 students, together with the vast new horizon of learning opportunities, I spent some time orienting my abilities to pursue architecture. Engraved on the architrave of a neoclassic library building on Michigan's central campus is the inscription "Knowledge, Wisdom, and the Courage to Serve." That reminder was a daily experience en route to

the School of Architecture. Continuing on that path seemed challenging to me because it combined the technical with the artistic and, not to be overlooked, the numerous associated requirements to create places for human activities. A lifetime of learning was ahead.

My work/study pattern expanded to include extracurricular activities and, most important, long hours in studio charrettes. Then came R. Buckminster Fuller! Every year, he graced our School of Architecture at the University of Michigan with two weeks of intense lectures, inventive projects, and working with student groups almost around the clock. His presence was unique and inspiring. His inquisitive mind and perpetual energy captivated the students of the whole school as well as many from the surrounding community. At the age of eighty-eight, he wrote:

> I am confident that the only thing important about me is that I am an average healthy human. I am also a living case history of a thoroughly documented, half-century, search-and-research project designed to discover what, if anything, an unknown, moneyless individual, with a dependent wife and newborn child, might be able to do effectively on behalf of all humanity that could not be accomplished by great nations, great religious or private enterprise, no matter how rich or powerfully armed.[2]

His love for our planet was extraordinary, his knowledge of technology and human behavior was rare, and his expansive "what ifs" had profound implications for environments, human existence, and technological futures. His presence made an enormous impact on the entire school while planting seeds of hope and expectation for each participant. Moreover, his thoroughness with each project established a model of professional service to emulate.

Bucky, as he wanted us to call him, held numerous patents including such things as the geodesic dome, the Dymaxion car, the Dymaxion bathroom, the laminar dome, rowing needles, a Dymaxion map, tensegrity, the octahedral truss, and many other unique projects and structures. A point of information: the Dymaxion Corporation, based in Bridgeport, Connecticut, was created by Mr. Fuller as the parent company for his many inventions and fabrications. As students we took Mr. Fuller's designs, or one of his patented inventions, and fabricated and built the project during our two-week experience. One year we built a thirty-three-foot-diameter paperboard geodesic dome; a second year we built a thirty-foot-diameter sphere made from plaster slats that fold up, without dismantling, into a five-foot-diameter sphere; and yet a third year we built a geodesic tent. The tensegrity structures were the most challenging objects to build, and my favorites. Tensegrity structures are characterized by their combination of a continuous tensile member and discontinuous compression members. They create sculptural form with extraordinary, and captivating, visual expression of the dynamics of tensile forces at work. The process of creating an idea, designing a product, figuring out how to build it, then fabricating the pieces, then constructing the project to make it function as intended, all had an enormous impact on all students involved. We worked

as a team, in contrast to the normal individual, competitive, and theoretical design studio problems.

During the summer months, I started working for a small architectural firm in Traverse City, Michigan. The office was identified through an endeared history of architecture professor, Ralph G. Hammett. The office was located on the shore of Traverse Bay of Lake Michigan. It was full of artistic talent, thorough detailing, and efficient management. The experience on large and small projects was priceless.

Midway through the first summer, after having been taken to several construction sites for supervision trips, I was sent back to one site on a solo mission to see the construction progress and then report back to the office. I had met the contractor's supervisor on previous visits. He cheerfully greeted me with a trowel in hand and promptly requested that I show him what an adobe-surfaced fireplace should look like. The fireplace surface had been described on the construction documents, but the surface had never been fully detailed. The challenge was a surprise, yet it had to be accepted. The rest of that day was spent on the construction site having a wonderful, albeit pressured, experience creating this adobe finish over the substrate of masonry. A hands-on experience never to be forgotten and later to be emphasized in my own classes. Admittedly it was my first experience with adobe construction, but the success of it is evidenced yet today with the presence of that fireplace in that country club. That taste of reality, quality, and design firmly established a principle to achieve in subsequent work.

Other experiences working at that firm included involvement with several projects where every person connected with the project from inception to occupancy worked together as a team of professionals committed to achieving the very best project within many limiting parameters. One of these projects was an intermediate school in a rural community. When the project was finished, it included an additional classroom within the budgeted costs—a needed and valued addition for the educational programs—derived from savings generated by the whole project team's collaboration on an efficient building schedule. That contractor's commitment to the project exceeded the extra for-profit potential. In retrospect, this is yet another example of the blessing of interconnectedness of people working together for a common purpose.

Upon finishing the professional segment of my education, and following a two-year military obligation to my country, I returned to the Traverse City architectural office as an intern. The broad yet specific training was pure joy. It also launched a next step to return to graduate school. Along that path, I was invited to teach basic architectural courses at Ferris Institute for one year, filling an on-leave position. The experience added another dimension to my discovered abilities. After the first week of butterflies when facing eager young people learning some basics in architecture, the sharing of my limited knowledge and professional experience reinforced the goal to gain more knowledge.

The next year I returned to the University of Michigan to work on a graduate professional degree in building structures. The opportunity arose to teach first-year

undergraduates some basic courses in architecture. The schedule to teach as a full-time instructor and commence graduate studies became the next three-year pattern of pursuit. That first year of teaching was demanding. It was the only time when I had a schedule of six 8 a.m. courses. A beginning drawing studio filled the MWF mornings, and on TTS the subjects of statics and strength of materials filled the learning periods. The studio included four graduate assistants, and together we offered some solid personal guidance to each student. The Saturday classes were tolerable only because, after class, one joined the mass of people walking to the stadium, a smaller version of "the Big House," for an afternoon of Wolverine football.

My graduate study continued an interest in building structures. Upon completion of that degree, I took my professional architectural exams, and the following year I added my professional engineering exams in civil engineering. These marathon interrogations became the basis to launch professional practice together with teaching. A promotion at the university together with an invitation to join a young structural engineering office became a pattern of unique professional engagement for the next several years. Our office worked with varied architectural offices creating, developing, and specifying the structural requirements for their projects. Educational buildings, research facilities, high-rise residential buildings, churches, and schools were included with the array of building types. Of course the materials and systems for each project opened up a broad spectrum of opportunity to engineer. Most of the architectural offices we worked with had architects from the late Eero Saarinen's office. The principal engineer of our office was a very talented structural engineer who had architectural colleagues in Chicago, and we worked with them on several University of Chicago buildings along with high-rise residential towers and specialized precast concrete structures in the Chicago region.

Two unusual challenges of structural engineering arose due to antiquated building codes. First, we had a project for a high-rise residential building using masonry bearing walls. The codes still required that for every increment of height of wall, the wall was required to increase in thickness. That code produced some notable historic structures, but it typified the drastically diminished availability of usable interior space. Such inefficient use of material served its place in history. However, masonry structures had never achieved their potential of strength inherent to the material. For this project we designed the masonry to reach higher strength levels, and then reinforced it, where necessary, to prevent any potential tensile forces from cracking the brittle masonry. The crafting of the building was adapted to accommodate the additional reinforcement. Detailed scrutiny was demanded by every public official associated with approving the project. This experience later became the basis for further research on these structures. The second unusual project was the design of a roof structure of a large church. The triangulated roof structural system created a column-free space over the worship and altar spaces. The outer steel trusses spanned more than one hundred feet and were about forty-five feet tall. They in turn supported another steel truss that divided the nave from the chancel and created a major light source for the

altar. That truss supported several long-span engineered wood structural members fanning out to cover the entire nave. Again the codes were vague about this type of wood roof structure. However, it was designed, installed, and finished after many reviews of safety, construction methods, and comparative justifications. The intense involvement with each of these materials established a sense of beauty for every square inch of the material's natural properties and for the integrity of associated methods of construction.

At the university, my teaching responsibilities centered on structural mechanics, structural systems, and building technologies as part of a designated design studio. My involvement in national professional organizations was growing, and I took on a very active role in a group focused on teaching structures in architectural programs. That is where I met the late Professor Herman D. J. Spiegel from the School of Architecture at Yale. Although most faculty in this structural group came from architectural schools in the United States, several came from Canadian, Australian, and British schools.

This experience began my involvement with national organizations during the next twenty years. In one group, we initiated some professional continuing education opportunities. Although the format is vastly different today, such opportunities continue and have expanded extensively. Through that professional service, I was invited to serve as a member of accrediting teams to review architectural programs in their cycle of five-year reviews. These great experiences led me to refocus my abilities on teaching materials and engineered building structures in very practical terms for design applications.

That period afforded another new experience. I was invited to head the Department of Architecture at Iowa State University. Typically as a land-grant institution, it was organized with the architecture program in the College of Engineering, the art program in the College of Home Economics, and the landscape architecture program in the College of Agriculture. The professional architectural program had converted to a six-year professional degree program in an attempt to bring more liberal arts studies into architecture. At that point in history, the six-year format was the latest trend in architectural schools in North America. It was spawned by the late Charles Moore, past dean of architecture at Yale. At ISU, the new program was starting to take root and needed more development.

At first, this opportunity seemed out of the question. Then the challenge was accepted and our family moved to Ames, Iowa. The department had a large enrollment, and the new six-year professional program was in transition. The diversity of the faculty formed the basis for developing the program with intended commitments. The addition of a Professional Advisory Group reached out to the very strong architectural community in the state and gathered a welcomed influence for support and vision. Together with strengthened program ties with art and landscape architecture, the seed for collaboration grew. The next logical effort was the creation of a Design Center with collaboration on exhibits, public lectures, conferences, and special seminars. The

program flourished and achieved professional accreditation as a new program. Later in the university's history, this effort led to the formation of a College of Environmental Design at Iowa State University.

As one can imagine, the responsibilities expanded administratively, which diminished the amount of time available for teaching. The university actively resisted involvement by its faculty in substantive professional practice beyond modest consultations. At that time, the basis for substantive architectural research had yet to be established at this university. So when Herman D. J. Spiegel, then dean of the School of Architecture, invited me to Yale to teach structural engineering courses in architecture, a tension arose between nurturing what had begun at ISU and venturing anew at Yale with some prospect of professional practice as well. Contemplating the prospect of a major change for my family was unexpected. However, over the next few months the lure of teaching gained momentum, and my family seemed to accept the potential new opportunities.

In 1975 we moved to Branford, Connecticut, and my career at Yale began. The new community was more exclusive than expected, and so the trajectory veered. The factor of "service" took on new meaning professionally, academically, and socially.

Offering elective structural courses in a school known as a design school meant that some students with a solid background in math and physical science typically filled the class. For the students with a primary background in design, structures were a major challenge until they began to realize the beauty of visualizing the results of the analysis in its applications and opportunities for design. I started a small structures and materials lab in the basement of 305 Crown Street, where the Kosher Kitchen at Yale was also located. The lab became an aid to demonstrate strength properties of materials and, with models, of structural systems. When the School of Art moved out of the A&A Building, the lab moved to the sub-basement location of that building. More tools and equipment were available, and the lab became more usable for students. When a materials course was added for all first-year students, the lab became the center for many class projects. Their design-build exercises produced many highly crafted objects.

In another structures course, I had students design and build models that illustrated a variety of structural systems as well as the use of materials, comparing and contrasting their properties and strength. Typically the creativity of young minds found some unique solutions, which propelled their learning beyond expectations. Some of these projects could be tested for strength, connection of parts, and stability. Structural form and scale for applications to buildings prodded their sense of how to realistically achieve potential objects. The inherent beauty of structures became obvious to those persons who chose to respect the essential qualities and natural properties of materials.

Professional consultation projects led me into the study of thin-walled steel products and extrusions. The extrusions came from the solar industry, where the early

production of collectors was not performing to acceptable requirements of structural behavior under strong winds – particularly in hurricane-prone regions of the country. Not only were the extrusions studied and redesigned, but also the supports of collector frames and anchorage to roof and trussed structures were developed. This prompted an International Solar Conference presentation on my work and a subsequent development of design guides. Other professional projects centered around the design of structural systems and specific elements for selected projects in local architectural firms. Things like aluminum trusses for solar collector panels, engineered wood structures, and steel structures became sources for unique applications and learning.

Through the Connecticut Society of Professional Engineers, I was asked to participate in a program of bridge design and competition in Connecticut secondary schools. This was a fun experience. In my aesthetic, bridges are beautiful examples of pure structure unadorned by facades. The program gave young students opportunities to develop their understanding of structural principles through bridge design and to construct models. Their projects would be tested in competition with submissions by their peers from other schools. The tests were performed on a prescribed day where these and other science and math projects were also presented. On visual review, a project could be assessed on how it might perform under a load test and how well the team understood forces, reactions, materials, connections, and structural systems. Testing would prove the assessment. Nevertheless, the enthusiasm and energy of each team effort represented an experience where individual knowledge was nourished.

Soon after coming to Yale, Cesar Pelli became dean of the School of Architecture. As he was beginning his major professional practice in New Haven, he asked me to be associate dean to deal with some administrative responsibilities at the school. Balancing my teaching, administrative responsibilities, and professional consultations became demanding and expanded my associations with more segments of Yale University. Several years later, I was asked by the provost's office to serve as chair of the University Advisory Committee on Accessibility, an opportunity I continued for two years into retirement.

During my early years at Yale, I was invited to serve on the board of the Connecticut Hospice, which was just beginning to develop its first facility in the United States. Also, I was asked to serve on the board of directors for the New England Lutheran Social Services organization, which is centered in Worcester, Massachusetts, yet parent to approximately forty smaller social service groups throughout New England. The compelling childhood training for service seemed to emerge with significant importance. Subsequent years of service continued as I served on other boards of local community organizations.

Upon retirement, I was invited to offer a few seminars at the Yale-New Haven Teachers Institute on the subject of "Bridges." Although my expertise started from the technology of structures and materials, a much broader definition of the term was easily incorporated. The creation of any bridge permanently imposes upon communities,

individuals, and regions in many ways. Just like a building changes an environment and a community indefinitely, bridges require people to adapt significantly.

One may not justify service as an intellectual trajectory; however, it does expand the context wherein any intellectual growth commences. As in my case, I see it as essential to the wholeness of life and to the interrelatedness of people with one another. Ideals and everyday applications in life cannot be treated as mere labels for isolated pursuits without the acknowledgment of body and soul being one, together with each member of humanity, and in our world as one planet.

Notes

1 Martin Luther King, Jr., "Remaining Awake Through a Great Revolution," *Oberlin Alumni Magazine* (August 1965): 6.

2 R. Buckminster Fuller, *Inventions: The Patented Works of R. Buckminster Fuller* (New York: St. Martin's Press, 1983).