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## ALMOST 50 YEARS OF THE UNIVERSITY OF MICHIGAN HUMAN FACTORS ENGINEERING SUMMER CONFERENCE

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In 1957 Paul Fitts and Daniel Howland offered a human factors summer course at Ohio State University. Fitts moved to Michigan in 1958, and the next year he offered essentially the same course in Ann Arbor. The course has been given every summer since then. An estimated 3500 students from a diverse set of industries and countries have completed one or two weeks of the course. The list of lecturers includes many of the leaders who have shaped the field of Human Factors Engineering (HFE), and the course has gradually morphed from focusing on operators working with traditional hardware systems first to users of interactive computer systems and now to complex systems that incorporate computers and people ubiquitously. This paper will trace this history and comment on a few of the inevitable anecdotes that go with 50 years of experience.

### INTRODUCTION

In 1957 Paul Fitts and Daniel Howland offered a human factors summer course at Ohio State University. The next year Fitts moved to Michigan, and the year after that he offered essentially the same course in Ann Arbor. The course has been given every summer since then. In the Summer of 1961, I (“I” refers to the first author, who in 1974 left Ann Arbor for the Cambridge, Massachusetts technology firm Bolt Beranek and Newman—now BBN Technologies. That year, Paul Green joined the staff of the course as the Ann Arbor contact point. After that time we use “we” in this narrative.), as a first year graduate student, had the distinct honor of being the course assistant to Fitts, which meant showing the slides and acting as a general go-for, and have been involved in the course ever since.



*The late Paul Fitts, the originator of the Michigan course.*

In May of 1965 Paul Fitts died suddenly and tragically of a heart attack at age 54, and Professor Arthur Melton and I, now a recently minted PhD, scrambled around to replace Fitts’s eight or so lectures for the course, which was scheduled for June of that summer. From 1965 to 2005 I have

chaired the course, but since 1974 Green has been continuously more involved, and in 1997 he became co-chair. In 2005 I turned over management of the course to Paul Green and Chris Wickens.

### ENROLLMENT

For the most part, enrollment in the course has reflected national trends of interest in the field. By the mid 1960s the course had approximately 30 students, with the number of students fluctuating year to year. After that, enrollment gradually increased to about 60 by 1975. New government agencies appeared during this period such as the National Highway Transportation Safety Administration (1970), the Occupational Safety and Health Administration (1971), and the Consumer Product Safety Commission (1972), and these provided impetus to the field. The heady years were from about 1990 to 1995 when we had 100 or more students every year, with the largest being 115. Particularly noteworthy was attendance from IBM, AT&T, and the Baby Bells. This growth reflected the advent of the personal computer and the public’s growing awareness of the need for better design, particularly in their PCs and VCRs. Since then the numbers have been in more or less steady decline, leveling off at about 40 students, for reasons we can only surmise. Our opinion is that due to the proliferation of shorter, more specialized courses, the need for the kind of general background our course represents has been attenuated. Looking at the numbers we estimate that more than 3,500 students have received certificates from the course. Many of our students have become members of HFES and/or gone on to interesting human-factors careers. In a final note about enrollment we note the drastic change in the gender balance. In 1965 there was one woman in the course. (At the “graduation” banquet she was presented with the “diamond pin” award, which consisted not of a diamond pin but a “dime-and-pin”. Although rather sexist by current standards to single out the only woman in the class, at the time she went along with it good naturedly.) Today usually half the class are women.

## COURSE CONTENT

By design, the course content changes only slowly over the years. You can think of it as a scrolling window in time. We have changed one or two lectures at a time, either because of the turnover of lecturers or to be responsive to student interests. The two exceptions are in 1996 when we completely revised the second week of the course to focus on human-computer interaction, and again in 2005 when we changed the focus to reflect the interests and capabilities of the “new management” of professors Green and Wickens.

The content of the course as Fitts represented it encompassed the ‘science’ of human factors and the “profession” of human factors. About two-thirds of the course content was derived from what Fitts called “human performance theory,” which included his lectures on vision and visual displays, and several on human skilled performance. These lectures were augmented by those of Ward Edwards on decision theory, Wilson P. (Spike) Tanner on signal-detection theory, George Briggs on manual control, among others.

The professional aspect was presented by guest lecturers. Alas we do not have a complete record, but we remember Julian Christensen, Director of the Psychology Branch of the Aeromedical Laboratory, presenting Air Force applications, John Versace, then Director of Human Factors for the Ford Motor Company, discussing automotive applications, and Gustave Rath from the Business School at the University of Chicago presenting applications from an operations research perspective. Christensen continued to be a main-stay of the course, giving three or four lectures each year until his health declined in 1995, for a total of 35 years. Another long-term lecturer was Del Coates, an industrial designer who introduced the students to the role of aesthetics in design. He participated for 37-or-so years.

Over the years the fundamentals of human performance have remained a focus of the course; there are still lectures on vision, audition, and human skilled performance, but on the other hand the content of these lectures has changed to reflect new points of view such as human information processing, attention, situation awareness, multi-tasking, and cognitive science.

On the applied side, the application-specific lectures were phased out in favor of an increased number of lectures focused specifically on timely human factors and ergonomics issues. Thus, we have had lectures on a wide variety of topics, as shown below:

- Time-sharing and multi-tasking
- Human performance models (originally manual control, but then broadened to reflect network-oriented models)
- GOMS, and more cognitive models
- Supervisory control
- Engineering anthropometry
- Industrial ergonomics
- Human-centered automation
- Expert systems
- Human error

- Human-computer interaction.

In 1964 Fitts, in his bibliography for the first lecture, cited ten books that reflected the general references in the field. In 2005, 27 books were cited, that barely scratched the surface, and this list excluded a second set of 9 that were listed as “of historical interest only.” Today, websites and human factors standards augment the reference list as well.

The course also includes seminars and workshops. The collection of workshop problems, worked on in small teams, has remained reasonably stable over the decades. Far and away the favorite problem is to design the workstation for an underwater roving vehicle that communicates with the mother ship by acoustic signals, leading to a communications time delay. This problem began life as the robotic lunar vehicle, but as the Apollo series of space launches came to an end the venue was converted to the underwater domain. Interestingly, to make this switch only a few of the specifications had to be changed. The workshops often generate a lot of enthusiasm. One team, preparing to make their ten-minute presentation of a personal digital assistant-based, police accident investigation form, invited a campus security officer to come into class to give a testimonial to the quality of their design.

## THE LECTURERS

The list of lecturers reads like a who’s who of human factors. In addition to Fitts, Melton, Edwards, Coates and Christensen, there were, among the retired and deceased, Alphonse Chapanis, Harry Snyder, Robert Williges, David Meister, John Gould, Irwin Pollack, and Daniel Weintraub. More contemporary stars have included Chris Wickens, Bob North, Thomas Landauer, Clayton Lewis, Arnie Lund, Judy Olson, Debra Mayhew, Susan Dray, John and Claire Marie Karat, David Kieras, and Marilyn Tremain. At one time, of the roughly dozen faculty participating, five had served as president of the then Human Factor Society.

## THE STUDENTS

The students who have attended the course make up a diverse bunch ranging from a designer of body armor to a Presbyterian Minister. The minister said he came because he wanted to gain the perspective of his parishioners, many of whom were blue collar factory workers. He also believed that the church could use human factors tools to improve their approach to administration. But the core attendance has always been from government and military laboratories and from the aerospace industry. Beyond those groupings, students have come from a wide range of places: from the information technology industry, the power plant and other process-control operations, transportation (including automotive and off-the-road vehicles). To mention companies, we have had attendance from Steelcase furniture, and for many years Whirlpool appliance sent us a student or two. And we always have one or two attendees who make their living as forensic consultants.

By and large the students fall into one of three categories: those who are (1) relatively new to the field with no formal

background; (2) management personnel who have found themselves responsible for supervising human-factors specialists; and (3) relatively experienced professionals who wish to find out what's new in the field. We also routinely have had non-US citizens, from places like Canada, Japan, Spain, Great Britain, and occasionally Germany and Israel.

The students have sometimes referred to the course as "Camp Human Factors" because it has always been more than just lectures and seminars, including as it does a whole range of tours and social activities. We do know, in fact, that two students who met each other at the course later married, although such liaisons are not a course goal. It has long been our belief that in a profession where people matter, colleagues in the class are a valued resource because they bring diverse experiences and perspectives to fundamental human factors problems.

### MURPHY'S LAW AT WORK

We have had to deal constantly with unexpected events. Of these, the most common are failures involving the audiovisual systems. (Ironically, due to the poor human-factors design of these systems.) In the beginning we gave presentations using glass "lantern" slides. On one memorable day the lecturer Randy Chambers arrived with a pile of nearly 40 glass slides. He handed them to the course assistant Terry Armstrong at the front of the room, and as Terry transported them to the projector in the back he tripped and the slides went flying. Some broke, but more devastatingly for Randy, neither he nor Terry had no time to put them back in order. Today the improvement in technology means that we experience constant aggravation with the computer projection systems that we use to present PowerPoint slides.

But the most startling unexpected event was the Air Traffic Controller's strike of 1981. The students arrived at the course without difficulty, but the strike began on the first day of the course. Two lecturers were unable to travel to Ann Arbor. We invited them to give their lecture by telephone (this was well before collaborative technology), with us coordinating their slides. One refused the invitation and the other accepted. The one who refused said that he relied so heavily on the feedback from the live audience that he felt uncomfortable with a remote lecture. This left one of us (Pew) to give his lecture, alas inadequately. The lecturer who agreed to the telephone presentation actually gave a better lecture than he had previously in person. In his case he was often distracted by feedback from the audience and the lecture went more smoothly. (Based on this experience, after Bob Williges experienced the accident that confined him to a wheelchair, he routinely lectured from Blacksburg while we experimented with various visual/auditory presentation alternatives.) That year of the airline strike many students had difficulty getting home at the end of the course. One solved the problem by buying a bicycle and pedaling back to New Jersey. We received a post card a few days later indicating that he made it.

### CONCLUSION

The bottom line? We, and now Chris, have always looked forward to our participation in the course. It is very rewarding to take highly motivated students who come with little experience and give them the background and tools to continue growing in the field. Furthermore, the excitement of work in human factors is in learning all the various scenarios and "cover stories" in which interesting human factors issues are embedded. Each year we come away learning as much, and perhaps more, than the students.