In Memoriam
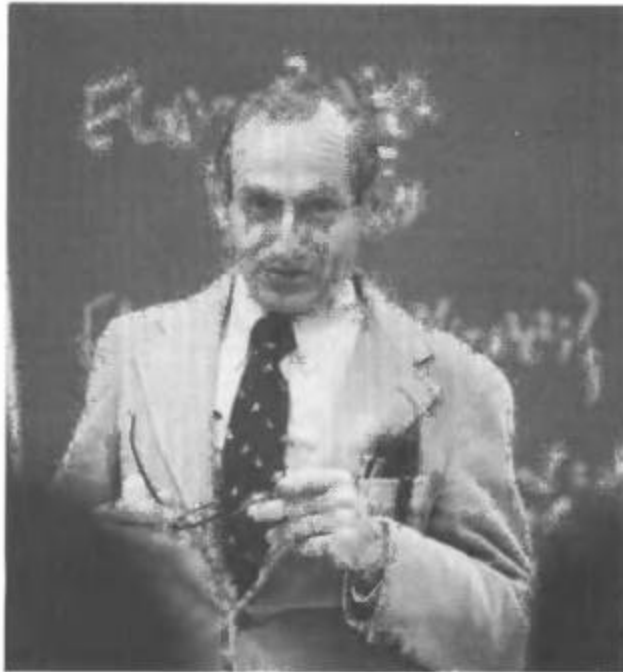

Edward C. Posner

1933 - 1993

Ed Posner

Ed Posner, our dear friend and colleague, and Chairman of the NIPS foundation (the oversight body that organizes this conference), died tragically on the morning of June 15th 1993, just eight weeks prior to his sixtieth birthday.

Ed was hit by a truck as he bicycled to work at JPL on the same route he had used for the last 30 odd years, and was killed instantly. Ed is survived by his wife Sylvia, and his children Joyce and Steven.

Edward Charles Posner was a prolific and influential communications scientist and educator, and one of the most universally admired and respected members of the IEEE Communications Society. He was a founder of neural network research and of the NIPS conference, serving as General Chair of the 1987 conference.

At the time of his death, Posner held the post of Chief Technologist of the Office of Telecommunications and Data Acquisition at Caltech's Jet Propulsion Laboratory, and was also visiting Professor in Caltech's Electrical Engineering Department.

I first met Ed in the late 70's at an information theory conference. I grew to respect his phenomenal organizational and human talents when we collaborated on the 1985 International Symposium on Information Theory in Brighton England, he as program chair and I as general co-chair. The last time I saw him was the night before the terrible accident when he handed over the NIPS accounts and check books to me in my office, quipped a "Posner Pun" about accounts and accountants which I can't remember, and went home. I didn't know him as long as some of the people here, but I worked with him every day since arriving at Caltech in 1985 and grew to realize that Ed was above all the most charming, kind, wise, witty, and public-spirited person that I have ever met.

More of Ed's human qualities later, first I'd like to talk about his early days.

Ed Posner was born August 10, 1933, in Brooklyn, N.Y. He attended New York City public schools and graduated first in his class, from Stuyvesant High School, in 1950. Paul Cohen, (winner of the Boucher Prize and the Fields Medal) and his lifelong school friend described how they would solve puzzles, play practical jokes, and compete ferociously for top of class. Early on, Ed discovered the algorithm for winning the game of NIM, and pretty much cleaned up on marbles in the playground after that.

Just two short years after high school graduation, Ed received a B.A. in Physics, and the following year an M.S. in Mathematics, both from the University of Chicago.

Although he spent most of his professional life closely involved in the research and development of communication systems, he began as a pure mathematician. In 1957, he earned his Ph.D. in mathematics at the University of Chicago, under the direction of Irving Kaplansky. Ed's Ph.D. thesis was entitled "Differentiably Simple Rings," and it was only 26 pages long, the shortest in the history of the University of Chicago, a fact that Ed was quite proud of. His early work in ring theory was very influential, and "Posner's Theorem," characterizing prime rings satisfying a polynomial identity, is still quoted by ring theorists.

During his graduate studies, Ed also worked part time at Bell labs in New York City, his home town. Although of no obvious relevance to his career at the time, his work at Bell Labs was to have an important influence almost 20 years later, when he began serious research in traffic and switching for telephone communications, and the application of neural nets to telecommunications problems. Ed claimed that he used to sit at Nyquist's old desk at Bell Labs - perhaps that's what did it.

After his Ph.D., for the next four years, Ed worked in academia, first as a mathematics instructor at the University of Wisconsin. A story relates that while he was in Wisconsin he hitched a ride with a lumber truck. In conversation, the driver explained he had trouble fitting all of the different types of lumber on the truck. Well, Ed solved a second order Diophantine equation on the spot to help him out. That was typical of Ed's approach to helping people - he would decide what needed to be done, and then do it, right then, no delay, no prevarication.

Ed then became an assistant professor of mathematics at Harvey Mudd college in Pasadena, and in 1960-61 also worked as a consultant at Caltech's Jet Propulsion Laboratory.

Then In 1961, Ed Posner was hired by Sol Golomb to head the Information Processing Group in the Telecommunications Division at JPL. This proved to be the beginning of Ed's life's work. For the next 10 years, he built the group, already good, into one of the strongest information theory research groups in the world. At one time or another during his tenure, the group included Odu Adeyemi, Len Baumert, Elwyn Berlekamp, Hal Fredricksen, Bob Gray, Al Hales, Larry Harper, Bob McEliece, Gus Solomon, Gene Rodemich, Howard Rumsey, Richard Stanley, Jack Stiffler, Herb Taylor, Henk Van Tilborg, and Lloyd Welch. All, pillars of the information theory and communications community. The group's strength in large part was derived from Ed's remarkable knack of finding problems which were both challenging to the theorists, and useful to the project engineers. Posner's legacy from this period includes a very large body of theoretical work in information theory, including his own profound work, done in collaboration with Rodemich and Rumsey, on the epsilon entropy of random processes, as well as NASA project applications including error control coding for telemetry and command, data frame synchronization, data compression systems, phased-locked loop design, and ground-based antenna arraying.

After he left direct research supervision at JPL he rose up in a series of planning and management positions, where he was an aggressive and effective advocate for the importance of basic research to the long-term health of the U.S. Space Program.

At the time of his death, he was Chief Technologist for the Telecommunications and Data Acquisition office. His diplomatic but inflexible intolerance of shoddy work, his ability to cut through bureaucratic snarls, and his genius for recognizing and nurturing talent, helped to make JPL, and especially the Deep Space Network, one of the most successful large project centers in the world. Because of his influence, a generation of mathematicians and information theorists became welcome and useful contributors to the U.S. Planetary Exploration program. Ed perhaps more than any, was directly responsible for delivering all those exciting first close-up pictures of the planets to our TV screens.

In 1970, Ed became a part-time member of the Caltech faculty, initially in the Applied Mathematics Department. In 1972 he was recruited by John Pierce, who had come to Caltech himself in the previous year, to serve on the Electrical Engineering faculty, which he continued to do until his death. He cherished his career as a Caltech Professor, and devoted an enormous amount of time to it, despite the fact that officially he held only a 50% appointment. I worked with Ed every day and in no way was he a "half timer". He contributed a full load at both Caltech and JPL - a masterpiece of time management.

Ed supervised more than a dozen Ph.D. students, many of whom are now working in telecommunications research in both industry and academia. At the time of his death, he was supervising seven more. He was a wise and generous research adviser, spending countless hours helping his students with technical details, and explaining to them how their work fit into the larger picture of modern technology, but rarely allowing his name to appear on the papers that resulted from this collaboration. Many of Ed's students were supported by a grant from Pacific Bell, an organization with which Ed had developed very close and cordial ties over the past 10 years. Every year, he taught a popular course on Communications Traffic and Switching, in which he introduced students to the mathematical foundations of telephony.

A dedicated supporter of Caltech's SURF (Summer Undergraduate Research Fellowship) program, Ed had sponsored 16 SURFers since 1984, who worked on a wide variety of topics from music synthesis to aids for the deaf. He also co-founded the SURFSAT satellite program with Robert Clauss at JPL, which aims at putting student projects into space. Between 1988 and 1991, he co-sponsored 20 SURFSAT students at JPL with Clauss. Posner had also served on the Freshman Admissions Committee since 1991 and the President's Fund Committee, which funds innovative research by Caltech faculty and students at JPL, since 1990.

And now to Ed's scientific contribution. His research interests were remarkably broad. When reviewing his work I found that he had written over 200 articles for scientific publication. This scientific legacy speaks for itself. The topics of Ed's papers range from Communication Technology, to Computer Science, from Traffic and Transportation Technology to Neural Networks.

His research interests at the time of his death ranged from video compression and enhancement, to queueing and traffic models for new civil telecommunications services, and from multiple-user radio communications to planetary radar signal processing and neural networks.

He began, technically, in a narrow area of mathematics, but at the end, he had a overall broad and deep knowledge of modern technology, especially, but not exclu-

sively, communications technology, unmatched by anyone ever I knew. When neural networks became important, Ed, well over 50, mastered them, and became one of the founding members of Caltech's Computation and Neural Systems program. By some miraculous internal chemistry, he was able to keep the wheels of change and growth turning right up to the end. I think there's a lesson there for all of us.

Ed's neural network research was concentrated in the areas of applications of neural networks to communications systems, and the analysis of learning. Students that he advised, or helped advise, have become important young researchers in the field: Pierre Baldi, Tim Brown, Padhraic Smyth, and Santosh Venkatesh, to name a few. There is no doubt that Ed was a prime mover in our field of neural networks, and did everything in his power to progress the field while maintaining the highest quality, and the lowest profile of himself.

My favorite paper of his is entitled "The Capacity of the Hopfield Associative Memory." Written in collaboration with Bob McEliece, Gene Rodemich, and Santosh Venkatesh, they use signal to noise arguments borrowed from information theory to derive the incredibly elegant result that the capacity of the Hopfield net is bounded by $N/2\log N$.

By the way, Ed called his brilliant and quietly intense JPL colleague Gene Rodemich "The Fridge." Gene could always be counted on to rescue his colleagues from the thorniest mathematical thicket, and Ed would often say "Whew, this is tough one. Let's give it to The Fridge."

In addition to his JPL duties, his academic duties, and his research, Ed was also involved in an amazing number of technical project collaborations. For example, a few weeks before his death he jointly received a patent with other colleagues for an electronic anti-theft device for automobiles. I myself was working with Ed on a technology transfer project to implement network management expert systems into Pacific Bell. There were many others that I heard about. Ed never thought about personal gain in these projects, but always about the advancement of technology, and that these should result in just rewards for his collaborators and Caltech. Also, when talking about a particular project, one always had Ed's full and complete attention, and received his enthusiastic and wise council. It felt like yours was the only project he was involved with.

Yes, Ed had a profound impact on many of us here. But in a sense I feel that we have been cheated of Ed's most influential years. Ed was at the stage in his career where he was starting to have significant national influence on the future direction of science and technology in the USA. I felt certain he was headed for honors and awards in his mature years, though characteristically, he would never seek them.

Well, we intend to honor Ed at this conference by dedicating our after dinner speech to him, henceforth to be known as the Posner Memorial Lecture. Caltech is honoring him by establishing a SURF endowment that will fund his cherished undergraduate researchers.

I'd like to now turn to Ed's unique human qualities: his ability to recognize talent, make wise and accurate decisions, his punctuality, and of course - his humor.

In places like JPL and Caltech, our continued success depends almost entirely on our ability to recognize and recruit talented newcomers: without them, we'd soon

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dry up and wither away. More than anyone else I ever knew, Ed had an infallible gift for recognizing talent. This room contains many people who were hired, or recruited as students, because of his influence. In this sense, he was able to amplify his influence, far beyond what he could have done, or what anyone could have done, as an individual researcher or manager. Part of this skill came, I believe, from his absolute ability to rise above petty jealousies, and to judge a person, even someone who might in some ways outshine himself, completely objectively. (This ability is rarer than you might think, even at Caltech.) But most of it was unexplainable and magical. Somehow, he was able to make amazingly accurate personnel decisions, and give wise accurate council, even on the basis of far too little information.

Ed was also the most punctual man I ever met. I never knew him to be late for a meeting - or for that matter early. Ed had an incredible knack of arriving seconds before the appointed time. This had its down side. If you have ever had to catch a plane with Posner you know what I mean. He would budget exactly the required time to catch the plane, arriving minutes before departure. On the drive to the airport one was convinced that you were not going to make it. You always did. After two trips like this I (like most other mortals with nerves of less than steel) couldn't take it any more. I always went separately after that, arriving, unlike Ed, with lots of time to kill.

And now to Ed's legendary sense of humor. I never knew a quicker wit – in fact, I can't even imagine a quicker wit. He truly was "the fastest pun in the West". His dry Brooklyn delivery was often more important that what he said; he would perch his glasses down on the end of his nose and look impishly around, and everyone would laugh in anticipation. It's little known that Ed was an active member of the Toastmasters and an ideal emcee. Of course we always saw him sitting right at the front in any technical meeting, quipping away at the speaker, being a witty session chairman, or injecting humor as he moderated a dry panel discussion.

Here are a few memorable examples.

In a seminar once, in which a student described how he was involved in the design of a small satellite that would be launched at no cost by NASA, Ed piped up, "there's gotta be a catch somewhere – there's no such thing as a free launch."

One of his last papers, dealing with the application of information theory to a study of the human olfactory system, is called "A Code in the Nose."

In describing a respected colleague who had recently found religion, Ed remarked "he may have been born again, but he wasn't born again yesterday."

And of course there's his famous remark about the deep space error control project at JPL called the Big Viterbi Decoder, and of course shortened to BVD. The first time Ed heard this acronym in a meeting, he instantly remarked "we're used to working with hardware and software, but this is the first time we'll be working with underwear!"

I don't think its too ungenerous to say that Ed was NOT always a good speaker. His lectures in class were sometimes very dry, and students sometimes grumbled. Of course Ed recognized this in himself and made fun of it. Ian Galton, a recent graduate student of Ed's, recounts the time that they each taught different sections of EE160 during the same quarter. A student came to Ian with a note from her

doctor and asked if she could take an incomplete in the course, because she had chronic insomnia which made it difficult for her to work. When Ian mentioned this to Ed, without missing a beat he said "have her switch to my section - I'll put her to sleep."

Yes, he was a great wit, but he was not a clown. Just the opposite. He never took himself seriously, but everyone else learned to take him very seriously indeed. When Ed spoke, people listened. What I will miss most about him, I think, is his wise counsel, always immensely helpful, but always dispensed with a twinkle in his eye.

I walk past his office every day, and I still half-expect to see him pop out of the office and say surprise! It was all a bad dream. Dammit Ed why couldn't you have been 5 minutes late for once in your life on that terrible day. Well, someday June 15, 1993, will be a long time ago, and we'll all feel better about this terrible tragedy than we do now. Our grief will fade, but our memories of Ed will not. What we'll remember, what I'll remember is that he was a witty, wise, kind, patient, self-aware, and deeply committed man. Above all, I'll remember, and be proud, that he was my friend.

Thank you Ed for being here for us, and I know that if you could give us one last word, it would be your favorite parting phrase - CARRY ON!

Rod Goodman

"with a lot of help from my friends:" Bob McEliece and Sol Golomb