

DOCUMENTS OF THE GENERAL FACULTY

**REPORT OF THE MEMORIAL RESOLUTION COMMITTEE FOR
EDWARD W. ODELL**

The special committee of the General Faculty to prepare a memorial resolution for Edward W. Odell, professor, mathematics, has filed with the secretary of the General Faculty the following report.



Dean P. Neikirk, Secretary
General Faculty and Faculty Council

**IN MEMORIAM
EDWARD W. ODELL**

Edward (Ted) W. Odell lived a life of accomplishment and grace. His professional achievements include internationally acclaimed mathematical research and administrative leadership in the department and at the University. To his many friends, colleagues, and family members, Ted was a wonderful human being who brought joy, calm sense, and delight to everyone who had the privilege to know him. At the moment of his far too early death, Ted was doing world-class research, accepting a high level of administrative responsibility imposed by his personal sense of social duty and experiencing the richness of a wonderful, loving family and wide circle of friends. His absence is strongly felt in the department, at the University, in the research community, and most profoundly, among his family and friends.

Edward W. Odell was born on March 15, 1947, in New York and died in Texas on January 9, 2013. He earned his B.A. in mathematics at SUNY-Binghamton in 1969 and his Ph.D. from the Massachusetts Institute of Technology in 1975. After a postdoctoral scholarship at Yale University, he came to The University of Texas at Austin in 1977 and spent the next thirty-six years as a member of the Department of Mathematics.

Ted's excellent mathematical research made him a leader in his field from soon after earning his Ph.D. until the present time. He also had a superb talent for explaining deep theories and arguments using easy and convincing approaches, often using simple pictures. The combination of his international research stature and his excellence at exposition meant that he frequently received invitations to give lectures and lecture series around the world. For example, he presented series of lectures in Spain, Great Britain, and China, and he was an invited speaker at the International Congress of Mathematicians in Zürich in 1994.

His significant research accomplishments began during his graduate school days. He received his Ph.D. from MIT, but actually did most of his graduate studies at The Ohio State University, where he worked with William B. Johnson in Banach Space Theory. He had become interested in this area of mathematics while taking a course during his undergraduate studies at Binghamton. His excellent thesis contained results that led to two important papers, one with Johnson on complemented subspaces of L_p [6], the other with Haskell Rosenthal on the characterization of the property of a Banach space containing ℓ_1 by properties of its bidual [17].

Ted's thesis work was merely the beginning of a long and productive research career. He was a very highly regarded member of the Banach space community. He authored nearly a hundred research articles, including many that represented major breakthroughs in the subject. Ted was an expert in combinatorial and set theoretic methods in analysis. In particular, he was a leader in the field of infinite Ramsey theory, a theory he introduced and popularized in Banach space theory in his much-cited survey paper of 1980 [10]. In this paper, he presented several new proofs of old results using Ramsey's theorem. He also used these combinatorial tools to study links between the finite and infinite dimensional properties of a Banach space.

Among his many results, the solution of the Distortion Problem of Hilbert space, which he obtained with Thomas Schlumprecht in 1992, was one of the highlights of his contributions in this area [12]. Roughly speaking, their result states that given a separable and infinite dimensional Hilbert space, one can find equivalent norms that have the property that on no infinite dimensional subspace are they essentially a positive multiple of the usual norm.

In several papers with Dale Alspach and Ioannis Gasparis, as well as with his students B. Wahl and R. Judd [1], [2], [5], [9], [11], he undertook a systematic study of ordinal indices of Banach spaces. These indices are invariant under isomorphisms and provide important tools for the isomorphic classification of Banach spaces.

During the last ten years, he studied, along with several coauthors, the following type of problem: Given a certain class of Banach spaces, is there a universal space for this class, that is, a space U in which all spaces of that class embed? Since this type of problem is often easier to solve if one assumes that the members of the considered class have a basis, universality problems often reduce to solving Embedding Problems: Given a separable Banach space X enjoying a certain property P , is it possible to find a Banach space Z in which X embeds and which also enjoys property P and, moreover, has a basis?

Among other results, Ted solved, together with Schlumprecht, two old problems, one by W. B. Johnson, which asks for the characterization of subspaces of spaces which are ℓ_p -sums of finite dimensional spaces [13]. The other was posed by J. Bourgain and asks for a reflexive space that is universal for all super reflexive spaces [14].

The methods developed in [14] were extended and were used to find universal spaces for the class of Banach spaces whose Szlenk indices are bounded by a fixed ordinal [4], [16], thus resolving a problem that was stated by Pelczynski. With Dan Freeman and Schlumprecht, he established the universality of ℓ_1 as a space with separable dual space [3], meaning that every Banach space whose dual is separable embeds into an isomorphic pre-dual of ℓ_1 .

In 2005, Ted solved, together with Johnson, the following long-standing problem, which was first explicitly stated by Juan Jorge Schäffer in 1975: Given a Banach space X , let $D(X)$ be the Banach-Mazur diameter of the class of all Banach spaces isomorphic to X , i.e., the supremum of the isomorphism constants of all pairs of Banach spaces isomorphic to X . If the dimension of X is finite, say n , then it is well known that $D(X) = n$. Schäffer's conjecture, that for every infinite dimensional space the diameter is ∞ , was established in [8].

An area that attracted him since he started out as a Ph.D. student and to which he returned several times during his career is the study of L_p -spaces and subspaces. The work with his advisor, which is mentioned above, continues a line of research started by Kadets and Pelczynski. It is shown there that a complemented subspace of L_p is either isomorphic to ℓ_2 or isomorphic to ℓ_p or contains a copy of the complemented sum of ℓ_2 and ℓ_p . Later, both authors continued their research of *Small Subspaces of L_p* and studied the subspaces of $\ell_p \oplus \ell_2$ [7]. Then, in 2011, he showed, together with Richard Haydon and Schlumprecht, that every complemented subspace of L_p either is contained in the complemented sum of ℓ_2 and ℓ_p or must be so large that it contains a copy of the ℓ_p -sum of ℓ_2 .

He used his deep knowledge of L_p -spaces, which he acquired over his career, to attack a problem that originates in Harmonic Analysis and can be roughly stated as follows: Is it possible to find a *reasonable coordinate system* of $L_p(\mathbb{R})$, the L_p -space on the real line \mathbb{R} , that is generated by a single function only using translations? There are several papers on variants of this problem using tools from Harmonic Analysis, but this problem was never approached using Banach space theory. In joint work, first with Bunyamin Sari, Schlumprecht, and Bentou Zheng [15], and then in a still unpublished paper with Freeman, Schlumprecht, and András Zsák [4], it was shown that $L_p(\mathbb{R})$ does not have an unconditional basis consisting of translations of one single function.

Ted's technical accomplishments in research mathematics were only part of his contributions to the field. His manner of conducting himself in his position of being a research leader illustrates his kindness and character, well beyond mathematics. He cared for people; he took care in dealing with people, and he knew when it was important to take care. When new people appeared at a conference, he made sure that they were welcomed and included. He would invite them to come to lunch and dinner. He was one of the few so called "Big Shots" of the

area with whom people, especially young people, felt comfortable talking. Everyone could ask him questions without being afraid to look stupid. Even when he was not the organizer of a conference, he was one of the main focal points to which people converged. It is difficult for researchers in the Banach space community to imagine future meetings without Ted there.

At UT Austin, he would take care of new faculty, help them settle in, help them learn the ropes, and help them figure out what is important and what is not. Many post-doctoral fellows remember his help and kindness with great affection. He helped newcomers with everything from their teaching to their research to their retirement accounts. He was unfailingly kind and thoughtful.

Ted's research collaborators enjoyed working with him and enjoyed his insights and mathematical creativity. He was incredibly good at explaining difficult arguments using simple pictures that would extract the very essence of the mathematical ideas. He called this pictorial story the "comic strip version of the proof." He often gave these pictures names, thus making them even more memorable and illuminating. Some memorable names of proof techniques were: "the staircase example," "the fish scale argument," the "matching game," and when he said "pruning a tree" he did not mean gardening, but a certain mathematical procedure. However, he disliked it when a collaborator threw out a name, like a named theorem, that did not reveal what was going on. A collaborator once mentioned that the next step would follow from the "Lindelöff Property," to which Ted replied, "Lindelöff, Lindelöff, I don't even know how to pronounce this correctly; please explain." After the explanation, Ted drew a simple picture, which again completely captured the idea. Only then was he convinced that the idea was correct.

Ted had a very determined and discriminating taste in mathematics. There were things he liked and there were things no one could ever make him do or even think about. And he would state his opinions in no uncertain terms. Once Schlumprecht, as a young post-doctoral fellow, asked him a question about "Fréchet spaces;" Ted did not answer, but scribbled something on his pad. Since Schlumprecht is stubborn, he asked him again, and Ted continued to scribble, and finally, he got up and posted the piece of paper on which he was scribbling on his door. It showed a big "F" with a thick red bar across it, and he said with a grin, "no Fréchet spaces allowed in my office."

Ted thought of mathematics as an art, which one does because of its inner beauty. He loved clever ideas, and he was very good at coming up with them. Sometimes, he and collaborators would consider doing research in certain more applied areas, which might have some overlap with their research. Some topics, like signal processing, were potential applied areas to consider. In particular, Greedy Approximations, Greedy Bases, Frames, and other topics were places where Banach space expertise might be useful. But he resisted those possibilities. He did not want to pretend to be more applied than he really was if the only goal was to have higher chances to be funded. He said, "Until you show me how these things would improve my phone, I don't see why this is more useful than any area of pure mathematics."

There are many useful attributes you need and hope to find in a collaborator in mathematical research.

- You need somebody to come up with good ideas.
- You need somebody to correct your own ideas.
- You need somebody to remind you of known results.
- You need somebody who nags you, in a not too unpleasant way, to finally write up the results.
- And, most importantly, you need somebody with whom you feel comfortable and with whom it is fun to work—somebody you can have a beer with after the work is done, successful or not.

Ted had all those attributes and more and that is why so many people wanted to work with him. Some of his regular coauthors in recent years were Steve Dilworth, Dan Freeman, Bentou Zhang (all three were post-doctoral fellows at UT Austin), Richard Haydon, Niels Laustsen, Denka Kutzarova, Bunyamin Sari, András Zsák, and his long-time collaborator, Thomas Schlumprecht.

Mathematics can be frustrating. You might stare for days or weeks at the same white paper or empty blackboard without a shred of a good idea. When Ted did not come up with an idea, at least he would come up with a good

line and a funny comment to lighten up the frustration. One of these comments became an often-used line among his research group. It is about Ted's cat. As you know, Schrödinger's famous cat explains a paradox in Quantum Physics, but you may not know Ted's cat and her role in mathematical research. One day, Schlumprecht tried an idea that did not work and, because he is stubborn and because the group didn't have any better idea, Schlumprecht presented the same wrong idea a second time. Ted responded, "You remind me of my cat. When she wants to go out the front door but realizes that it is raining, she then tries the back door." So a standard expression in the research group became, "Are you trying to be like Ted's cat?"

Ted's many collaborators will really miss the joys and satisfactions of working with him. A friend of Ted's, N. Sivakumar, wrote a poem about Ted that captures some of Ted's spirit.

TED

His wit and humour served to soothe,
When research progress wasn't smooth;
His pictures were a joy to see,
Glimpses of theorems that soon would be.

His insights were a regular treat,
They caused obstacles to retreat;
Cleverness was his special gift,
It brought on results, neat and swift.

They came to him from far and wide,
Those who sought a master guide;
His nurturing ways and winning smile,
Made their journeys very worthwhile.

Gentleman, scholar, who stood tall,
Loved and honoured by one and all;
Our cherished friend, Ted is gone, (but)
Leaving memories that will live on.
Our cherished friend, Ted is gone,
Leaving memories that will live on.

Ted had a wonderful, self-deprecating and wry sense of humor. When he was heading off to teach a class, he would don an Eeyore-like, lugubrious expression and say, "I wonder how many lives I will ruin today?" and then trudge off to class. Of course, his colleagues all knew the irony of his remark, since Ted was one of the best teachers in the department. Ted had a certain clarity about the realities involved in teaching mathematics. One day, during a discussion about what important insights students really kept from a class ten or fifteen years later, Ted replied, "Oh, you mean integration by parts." That remark captured, as Ted often did, an important insight in a humorous way.

Ted's sense of humor was so basic to his character that several of his wry quips were included in the program of a celebration of his life. Here are a few of his memorable quotes, mostly from his calculus lectures:

- What if you gained knowledge by eating it? You could just put your textbook between two pieces of bread. Would you prefer that to the current method?
- Here would be a good test for sobriety: 'We want to see if you're sober, sir. Would you please set up this double integral?'
- I know that when I'm throwing you these theorems, you're screaming, 'Proof!!'
- Has anyone ever swallowed an insect other than for math purposes? (We can't really imagine the context in which this quotation arose.)
- Too many problems? That's why they invented weekends.

- I've often thought that I could do well with this: 'Having trouble sleeping? Listen to Professor Odell lecture on calculus for only \$19.95.'
- Thou shalt write thine path integrals with a ds .
- Now, I know you're thinking, 'That's all fine and dandy, crystal clear, but could we go into higher dimensions and make this more abstract, please?'
- 'What do you do?' 'Mathematician.' That usually stops the conversation.

Ted's research and teaching spanned his entire career, but as his sensibility and ability to work with a whole range of people became known and appreciated, during the latter part of his career especially, he was increasingly called upon to use his human gifts in administrative and educational roles. He had difficulty saying 'no' when people asked him to do something. So natural consequences followed; he served on infinitely many committees. Among dozens of services performed, he was associate chair of the department, he served as chair of the Graduate Assembly and as a member of the Faculty Council, and he co-directed the Inquiry Based Learning Project. He was constantly asked to deal with problem cases of one sort or another. One unintended consequence of all this administrative work is that it helped his research. As he put it, the more administrative work he did, the more he enjoyed his research.

In the late 1990s, some people in the department decided that upper-division undergraduate mathematics majors were not sufficiently proficient at producing mathematical proofs to be able to do well in the higher-level undergraduate classes. Since the academic response to any issue is to form a committee, a committee was formed, and Ted was appointed chair. He was generally appointed chair of committees that required reasonableness. One of the strategies that his committee proposed was to try to create a new proof introduction number theory course using an inquiry-based learning method of instruction. The idea was that if students did a lot more proofs on their own in this proof-introduction class, then they might become more able to deal with proofs in the higher-level classes.

An impressive illustration of Ted's character and open-mindedness is that he decided to learn this technique and try it for himself. He became convinced that students would be well-served to have some inquiry-based learning experience during their education, so he taught some of his own classes that way, and he helped the project enormously by developing materials, mentoring graduate students and faculty, and co-directing the inquiry-based learning project. One of the sets of inquiry notes Ted developed was designed to help students learn analysis. Analysis is a notoriously difficult subject for students—epsilons are the principle culprits, although deltas don't help either. Ted created a class that helped students face these denizens and, hopefully, befriend some of them—perhaps the deltas. Ted also wrote materials for an IBL number theory book *Number Theory Through Inquiry* with co-authors David Marshall and Michael Starbird.

Ted had a keen appreciation of societal needs served by the mathematics department. Among those is the education of future teachers. He said, "If we do nothing else, we must teach our future teachers." So he was a great supporter and champion of the classes that were principally populated by future teachers. The number theory and analysis classes were among the ones he taught personally, but in his capacity as reasonable-person-in-chief in the department, he advocated for support of classes and programs for future teachers and for support of the people who work on these issues. He was directly supportive of local schools by visiting classes in the local high schools and giving presentations and meeting students there.

In 2007, the departmental chair, Bill Beckner, appointed Ted as associate chair, whose responsibilities spanned the whole range of work of the department. In fall 2011, the new chair, Alan Reid, asked Ted to take on the role of associate chair of undergraduate studies. Ted accepted these responsibilities with his typical stoic good humor. When he took over the undergraduate program, every morning, he came to the departmental office to check in on current projects. He always carried his yellow pad. For weeks after taking over, he made lists, and lists of lists, on his yellow pad, as he determinedly digested all of the dozens of projects and activities needing his attention. Ted began running the undergraduate mathematics program at UT Austin with the skill, resolve, concern, and wonderfully positive attitude that characterized him.

During the time when Ted's responsibilities for the undergraduate program began, the department and college undertook many initiatives to increase the access and success of College of Natural Sciences courses and programs. Ted served on basically all the committees associated with the undergraduate program. One such

committee was the Undergraduate Studies Review Committee, which met weekly for a year, determining where the department's undergraduate curriculum was and where it should be in the twenty-first century. Ted was vocal and effective in this group, as far-reaching initiatives were mulled over and ultimately proposed to the department. During his tenure, Ted was also involved in the OnRamps precalculus dual credit program, the calculus transformation project leading toward increased student engagement, an National Science Foundation engineering grant to change the teaching methods in calculus discussion sections, college readiness initiatives, and many more projects. He had a tremendous impact on the undergraduate program at UT Austin.

Ted always worked to move forward and achieve positive outcomes, and he endured bureaucratic obstacles with appropriate respect. He was a note-taker extraordinaire in all aspects of his work life, and his minutes from meetings and discussions were thorough and humorous. At the same time, he took to heart all the troubles of those who worked with him, magically relieving them of their burdens as he took them upon himself. Folks in the mathematics department, who worked closely with him in his administrative role, loved his good-humored arrivals, and much laughter always ensued.

When working with Ted, one never felt like a work session was a pain; it was always a joy. Whether he was on a committee or working on a project, he never was a source of rancor or annoyance. Instead, he made every task lighter and more fun. In fact, Ted made daily life fun.

In preparing this memorial resolution, we naturally asked others for recollections. We approached one of his long-time colleagues in the Department of Mathematics, and he responded in a heartfelt manner about how he was a special beneficiary of Ted's thoughtfulness, including Ted's unfailing kindness and personal encouragement. We talked to many people about Ted—undergraduate students, graduate students, post-doctoral fellows, faculty members of all types, staff, and many of his friends, and we discovered that frequently they would start their comments with "Ted was especially kind and helpful to me." What was actually special was how Ted's grace and kindness touched all the people he came in contact with. His dignity and warmth made everyone feel his genuine, gentle kindness and basic human respect.

His world was not exclusively about mathematics and work. He was surrounded by a wonderful family. He married Gail, his wife of nearly forty-four years, on March 30, 1969. They have two daughters, Holly and Amy, of whom he was extremely proud, and whose accomplishments he spoke of often. His family brought Ted the joy and deep satisfaction that comes from seeing those you love and are loved by flourish. After his death, a piece of paper was taped on Ted's office door for people to write thoughts about Ted. Kathy Davis wrote one sentence of six words that really sums up what we all feel about him. She wrote, "Ted was the best of us." When people in the abstract describe the ideal professor, they want a great research mathematician who is an excellent teacher and who does exceptionally much and important service work for the department and university. Few ideal professors actually exist, but Ted really was one. His research was excellent and his productivity continued until his death. His teaching was exceptional. He was a talented and generous administrator. He gave his students and all of the rest of us a glimpse of a gracious and generous human being who lived life magnificently. He improved the lives of the students, faculty, and staff at UT Austin through his work and accomplishments. But putting his work and accomplishments aside, he gave us all a model of civility and grace that enriched our lives and whose memory will enrich us always.

Ted was the best of us.

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This memorial resolution was prepared by a special committee consisting of Professors Michael Starbird (chair), Jane Arledge, and Thomas Schlumprecht.

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