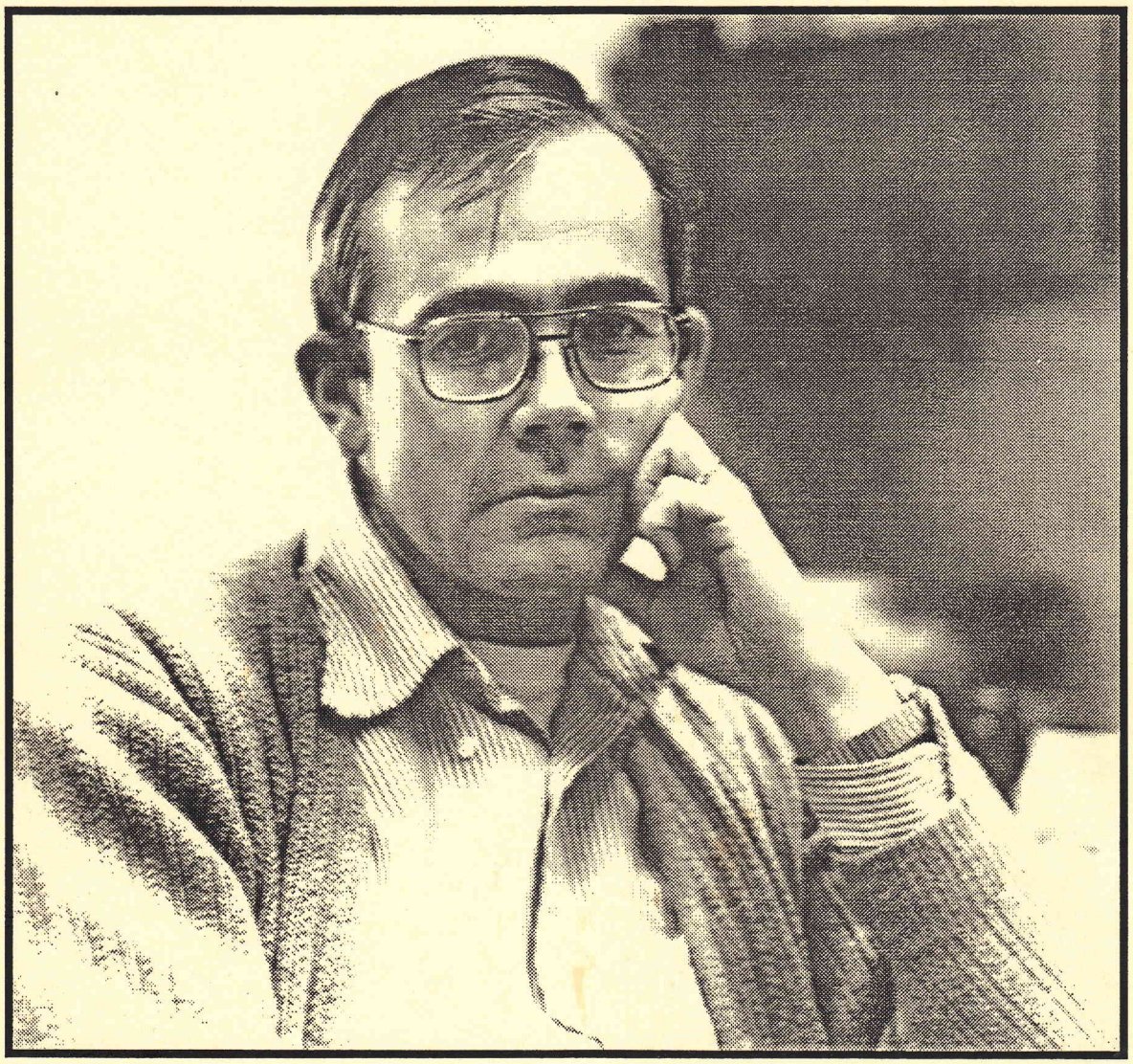
Lonnie Lee VanZandt
1937 - 1995



Reminiscences by Friends and Colleagues

6 September 1995

CONTRIBUTORS

On September 6, 1995 friends and colleagues of Lonnie Van Zandt gathered for an evening of reminiscences. This is a written record of their remarks in order of their presentation. Some colleagues who could not be present forwarded written materials which are also included here.

ARNOLD TUBIS

Lonnie Lee Van Zandt, 57, Professor of Physics at Purdue University, died Thursday, July 20, 1995 at home, after being in declining health for the preceding three months. Professor Van Zandt was born on September 29, 1937 in Bound Brook, New Jersey. He received the B.S. degree in Physics from Lafayette College (Pennsylvania) in 1958 and the degrees of A.M. and Ph.D. in Physics from Harvard University in 1959 and 1964, respectively. He was a staff member at the Ford Motor Company Scientific Laboratory from 1962 to 1964 and the Massachusetts Institute of Technology Lincoln Laboratory from 1964 to 1967. He joined the Purdue Physics Faculty as an Assistant Professor in 1967, was promoted to Associate Professor in 1970 and was Professor of Physics since 1982. In 1978, he was a Visiting Professor at Tsing Hua University, Taiwan.

He published over 85 articles in technical journals and supervised the Ph.D. research of eleven students. His early professional work was in the theory of electron transport in oxides. Since 1977, his research was primarily focused on the dynamical theory of DNA polymer and its interaction with electromagnetic radiation from the perspective of basic physics principles.

Lonnie's interests were not just confined to the specialized fields of physics for which he was best known to the scientific community. Any subjects that happened to pique his curiosity were fair game for his relentless scrutiny, and invariably led to articles and letters and memos to colleagues, journals, magazines and the news media, ranging from the Physical Review, Physical Review Letters, American Journal of Physics, Biopolymers and Biophysical Journal to the Lafayette Journal and Courier to the National Review, and to seminars and popular lectures. These subjects touched on esoteric issues in quantum theory and thermodynamics as well as very practical ones, such as the source of CO2 in the atmosphere and global warming, the transport of materials from earth to a base on the moon, the identification and accommodation of learning disabled students, learning how to view 3-D objects with the unaided eye from stereoscopic pairs of drawings, and the dynamics of the baseball bat. In the introduction to his article on the baseball bat, an article which was recently cited as a classic in its field by Robert Adair, Sterling Professor of Physics at Yale University, Lonnie wrote, "The baseball bat can serve as a familiar medium to draw the attention of students and lay audiences to the general subjects of vibrations and waves, the dynamics of collisions and flight of projectiles, the theory of elastic deformations, and a few other related topics" Here was Lonnie at his best, as a re-

searcher, and a teacher relating the joys of scientific inquiry to both colleagues and the general public.

Lonnie was a dedicated Ph.D. mentor and classroom teacher. He did not coddle students or strive to win popularity contests. In a note I received from him in 1990, there was attached an extremely complimentary letter from one of his students in PHYS 221, which described how helpful Lonnie was in helping the student prepare for his medical school exam. Lonnie wrote: "My reasons for passing this note on to you are, of course, transparent. But I feel that one letter like this is worth a thousand angry CIE pink sheets. This is what I believe should be the real end of teaching: somebody learned something."

Lonnie served on the Physics Qualifying Examination, Graduate Curriculum, Library, Ph.D. Certification, and Solid State Advisory Committees. He was a counselor for both undergraduate and graduate students, and was a member of the Executive Committee of Sigma Xi. He was a volunteer with the Tippecanoe Mental health Association, was active as a judge in local science fairs and as a member of the Physics Textbook Adoption Committee of the Tippecanoe County School Corporation. He was a member of St. Boniface Catholic Church of Lafayette, Indiana.

His first marriage was to Peggy Jo Boulware in 1961. His second marriage was in 1975 to Kung-Ching Lu. He is survived by his wife; children, Patricia A. Van Zandt of Baltimore, MD, Lonnie L. Van Zandt III of Denver, CO, Virginia E. Van Zandt of Charleston, SC, and Karl S. Van Zandt, at home; and three brothers, Ed Shea of Wheaton, IL, Roger Shea of Atlanta, GA, and David Van Zandt of Indianapolis.

In a very moving note to the Physics department on the day that Lonnie passed away, his wife, K-C, expressed in just a few words what I think Lonnie was all about. I would like to read here a portion of her message:

"We appreciated the cards, the flowers, the packet of information on brain tumors, the food people brought, and so on. We have been slow in writing to express our gratitude, partly because we wanted to try the shark cartilage treatment and hoped to be able to report good progress. Lonnie was a fighter. he never gave up even after we signed on with the Hospice Program for terminally ill patients. ....."

"Lonnie loved his job and field of Physics. He loved to solve problems and share knowledge. I know that he will be missed by his colleagues and the community. ..."

Yes, indeed Lonnie was a fighter, but a fighter in the best sense of the word. One might say that he was a fighter for clarity of thought. Lonnie never took anything for granted, and throughout his life, he shared his skepticism and sharp insights on many aspects of science and other areas of human affairs with students, colleagues and the general public.

We will all miss Lonnie. We need more people like him to keep us honest in the way we go about making sense of the world around us. To Lonnie's family, we give our deepest condolences and our sincere hopes that the memories of Lonnie's great courage and bright spirit will soon begin to ease somewhat the sorrow of his passing.

ALBERT W. OVERHAUSER

Of those here tonight, I am the first to have encountered Lonnie professionally. It happened as follows: In 1962 Professor Harvey Brooks, of Harvard, called me

in Dearborn, Michigan. He said he had a graduate student who wanted to pursue a thesis on a subject that would interest me. "Would you take him?"

A month later Lonnie arrived at the Ford Scientific Laboratory. His field of research was a very popular and important one: the unexpected electronic and thermal properties of noble metals (such as copper, silver, or gold) when alloyed with small amounts of magnetic elements (such as chromium, manganese, iron, cobalt, or nickel). Lex Gerritsen, at Purdue, was an important player in this arena. Incomprehensible phenomena occurred in specific heat, resistivity, magnetic susceptibility, thermal conductivity, magnetoresistivity, and thermoelectric power.

The last of these was the focus of Lonnie's endeavor. The giant thermoelectric power had been discovered thirty years before, in 1932, by Keesom, Borelius, and Linde. (This was not Piet Keesom, of Purdue, but rather Piet's father.) The observed thermoelectric effects were a thousand times larger than theory allows or, for that matter, larger than what is observed in pure metals. No one had found a physical explanation. The opening paragraph of Lonnie's dissertation portrays the dilemma:

> "The modern theory of metals begins in 1928 with Sommerfeld's simple model of a box of noninteracting fermions. In the light of later developments, the remarkable success of so simple a picture is better understood, but no less wonderful. The value of this simple box model, as a starting point for improved calculations, as a conceptual framework for the organization of ideas, as a numerical tool for the estimation of errors, persists even to the point that observational deviations from its predictions by factors of order different from unity are called anomalous, or giant, or some such term signifying surprise."

The title of Lonnie's thesis was, "Some Effects of Static Spin Density Waves on Electrical Transport." The motivation for such a study arose from the experimental work of Jim Zimmerman at the Ford Scientific Laboratory. He had discovered extraordinary specific heat anomalies in dilute magnetic alloys; and these could be explained quantitatively by a spin-density-wave, which is created by its interaction with the spins of the magnetic impurities. (Incidentally, it was Jim Zimmerman who with Arnold Silver, also at Ford, invented the SQUID and coined that acronym.) Lonnie found that inelastic scattering of conduction electrons by the transition-element spins did indeed lead to a thermoelectric power a thousand times larger than normal. Needless to say, the theory remained incomplete because the number and size of the spin density waves, together with their orientation, polarization, and domain structure were unknown. The concluding paragraph of Lonnie's thesis was:

> "We have not answered the riddle of dilute alloys; our theory is too simple. We have, nonetheless, established that in the search for understanding of these systems, the possibility of the existence of spin density waves is worthy of serious consideration."

Thirty years later, just a few years ago, Sam Werner (from the University of Missouri) finally proved the existence of spin density waves in dilute magnetic alloys by using polarized-beam neutron diffraction to study the appearance of weak magnetic satellites. Of interest is the fact that Sam and Lonnie overlapped at Ford as graduate students. Sam's thesis on the dynamical diffraction of neutrons from perfect silicon crystals (both experiment and theory) was supervised by Tony Arrott (who will be presenting the October 19 Physics colloquium). Lonnie appreciated, of course, that Sam's discoveries conveyed perpetual significance to his doctoral research.

It is interesting that the interval between discovery of the giant thermoelectric effect and the demonstration that spin density waves really occur was sixty years. Lonnie's illumination of the subject was a brief, but brilliant burst of light halfway inbetween. There is now a supergiant thermoelectric effect in the superconductor indium, which is too large by one hundred thousand. I hope that for Catalina Marinescu, who is to solve that enigma, a similar feat of heroic patience need not be required.

Lonnie defended his thesis at Harvard in February, 1964. During the following years I encountered Lonnie occasionally at physics meetings. Only after I arrived here at Purdue (six years after Lonnie) did our close relationship grow and become, for me, one of the treasures of my life.

Lonnie's scientific interests were very broad. Even in physics, he embraced topics from the foundations of quantum theory to the structure and motion of DNA. I used him as a sounding board to try out new ideas and, sometimes, I served in that role for him. When opinions clashed, it never mattered who prevailed, as long as there emerged a glimmer of truth.

Lonnie became the most articulate and skilled writer I have ever known personally. His creative forms of expression made reading his essays a literary joy. On this account I took advantage of him by providing him opportunity to read my own efforts. Invariably they came back all marked in red, and, as a consequence, much improved.

Most of all Lonnie was a friend. With him I could open my heart, whether my concerns were immanent or transcendent. For now, I must learn to invoke the many happy memories I own, and to surmise the counsels he would likely provide.

JURGEN M. HONIG

Lonnie first entered my life when he applied for a position at the MIT Lincoln Laboratory; in consultation with Ben Lax, who was the Leader of the Solid State and Condensed Matter Physics effort, I hired Lonnie on the strength of his seminar presentation and on the excellent recommendations of his graduate research mentor, Al Overhauser. We almost immediately began to puzzle about the then revolutionary discovery that many transition metal oxides are metallic in nature and that quite a few exhibited spectacular metal-insulator transitions as one altered the temperature. I was pleased to find that Lonnie not only displayed mastery of the intricate subject of electron interactions but also was an excellent experimentalist, with a keen appreciation of what was required to acquire reliable experimental data. Lonnie was one of several theorists at the lab who definitely did not have their heads in the clouds or rev-

elled in pushing big formulas around.

We soon discovered our mutual love for classical music in general and for baroque chamber music in particular. Lonnie played a mean flute and the resident librarian, Lloyd Rathbun, was a professional oboist; so, three of us frequently got together over the lunch hour to play wonderful pieces composed by musicians contemporary with or preceding Bach. I used to rationalize my difficulties in accompanying the other two by the statements that I had four or more sets of notes to read simultaneously, whereas they had only one line each, but I am afraid that I received little by way of sympathy on that account. Nevertheless, Lloyd and Lonnie were very tolerant of my attempts to keep up with them, especially in the fast movements, where I soon learned to drop notes in the inner voices when the going got rough.

In due time both of us ended up at Purdue University, where I preceded Lonnie by several weeks. I recall that he rented a van to transport his household belongings from the Boston area to Lafayette, and that he stuffed his books in a rented trailer to be towed behind the van. Since his library holdings were vast he overloaded that trailer to such a degree that it collapsed en route and had to be abandoned; Lonnie did not particularly care to be reminded of that episode later in his life.

The Van Zandt family first took up residence in an old Victorian mansion close to Murdoch park. However, the upkeep of this home became rather burdensome, even considering the fact that Lonnie was an excellent home repair man, familiar with plumbing, woodworking, electrical appliances, and other balky equipment that had a tendency to malfunction. This led him soon to start planning and supervising the construction of a new home on the West Lafayette side. Once he had moved there Trudy and I were regular visitors. We became good friends as well with the family dog, named after a Harvard professor whose classes Lonnie had attended; Lonnie claimed that both the dog and the professor were sons of bitches.

As another indication of Lonnie's type of humor I recall the occasion of my remark to him concerning the construction of the Pharmacy building on campus. "Look at this," I said, "this structure has seven sides." "Yes," was his reply, as he continued with a sigh, "but I wish the architect hadn't made all seven look like the back of the building."

For a while Lonnie and I played tennis over the lunch hour on the Purdue courts; when we got through he always claimed that the pros had nothing to fear from us. As always, he was absolutely correct. We also attended some of the Lively Arts performances; Lonnie particularly enjoyed flutists who engaged in bravura performances and made mental notes on how fast the brain had to send out signals to their fingers to keep up with the tempo of the fast pieces.

With the passage of years our rather intimate scientific collaboration gave way to a lesser degree of interaction: Lonnie focussed his attention of the them emerging area of biophysics with its many fascinating problems while, to his bemused observation, I remained a stick-in-the-mud in the area of oxides and materials research. Nevertheless, we continued to enjoy a really close friendship and I took every opportunity to visit Lonnie in his

office. I particularly enjoyed his sly sense of humor, his repartee and wit, and his understated remarks of outrage whenever our talk centered on the political scene, where he was a conservative and I baited him with my liberalist leanings. We also began to talk a lot about matters eschatologicala — it was almost as though he had a premonition of his early death and needed to unburden himself on the topic of his own conviction and faith. I realized that he was able to accommodate both his scientific career and his interest in spiritual matters in one harmonius whole, which is an unusual gift.

After years of being accustomed to seeing Lonnie at any time it came as a deep shock to learn through my Physics colleagues that Lonnie had been stricken by a brain tumor. I could not get myself to believe that this man, who was so very vigorous and had such a brilliant mind, would consciously have to face this particular deadly affliction. I tried to support him as best I could through the subsequent weeks. In the end I gained additional deep respect for the manner in which he handled his life when the specter of his death was beginning to haunt all of us. He told me that he had come to terms with the termination of his presence on earth; this set a memorable example that I will attempt to emulate should a similar fate befall me.

It is only through his death that I have learned what real friendship is all about.

PETER C. EKLUND

My graduate student days in the Department of Physics at Purdue University encompassed the period January 1968 - May 1974. In 1966, I met Prof. Duane Carmony (High Energy Physics, Purdue) in a summer course he was teaching at UC Berkeley. Prof. Carmony encouraged me to apply to the graduate school at Purdue, and I believe argued successfully for my admission in the Spring of 1968. My first exposure to research was that summer, measuring tracks on bubble chamber film for Prof. Carmony. The following summer I worked for Prof. Robert Meiher learning about ENDOR (microwave resonance technique) and defects in Si. Although both of these research experiences were quite rewarding, I was still looking for a better match to my fuzzy notions about Ph.D. thesis research.

My first interaction with Lonnie was, I think, in 1970. I decided to accelerate my course work in Solid State Physics by taking Physics 645 (Group Theory and Applications to Solid State Physics) from Lonnie as a one-on-one reading course. He said he didn't know much about group theory, and since he was scheduled to teach it the following year, he suggested we work together on the problems found at the back of the text chapters. I had a great time learning Group Theory with him. We met regularly to exchange solutions. My answers were usually correct, but it took me a long time—I wanted to show him I could do them well. During this stretch of time Lonnie and I became very good friends, which was simplified because he was only seven years older than I. We went canoeing in Canada one summer. I even tried a brief run at a theoretical thesis under his direction, but I soon learned that I couldn't sit at a desk long enough to do theoretical research—I needed to be in the laboratory. So Lonnie brought me to Prof J. M. (George) Honig (Solid State Chemistry, Purdue) and it was agreed that both of them would lead me through an experimental thesis on transition metal oxides.

I started work in Prof. George Honig's lab in the old Chemistry building and learned to grow crystals (from George Yuochunas) and to make electronic transport measurements from Ron Loehman (student) and Dr. G.V. Chandrashakar. After about a year, Prof. Honig asked me set up a lab in the new physics building near the Central Crystal Growth Facility. This put me just around the corner from Lonnie again, and we began a continuing series of sessions in his office on the puzzles of solid state physics (at least they were puzzles for me). I would stand at the blackboard with the chalk and Lonnie, with his feet on his desk, would guide me with great patience.

My first experimental success in the new physics lab was to extend an unusual crystal growth method to the production of single crystals of NiO. This so called "arc transfer method" had been developed a few years earlier for transition metal oxides, and involved a high dc current arc discharge between metal electrodes in an oxygen atmosphere. Interestingly enough, this experience with an arc discharge allowed my students at the University of Kentucky nearly 20 years later to rapidly enter the field of fullerenes (spherical carbon cage molecules). These molecules were discovered in carbon soot produced in the arc discharge between carbon electrodes in argon.

Unfortunately, the better job I did producing stoichiometric NiO, the more impossible it became for me to study the transport properties of this material–it stopped conducting charge (to be precise the sample impedance exceeded the input resistance of equipment available to me). Thus NiO seemed to be a dubious material for my Ph.D. thesis, and I was temporarily out of business. With great difficulty, electrical transport measurments on these NiO crystals were eventually made later by students in Honig's group.

Next, Lonnie, George and I became interested in the anomalous low temperature specific heat anomaly in V doped Ti2O3 which was discovered by Prof. Pete Keesom and his student Matt Sjostrand. They had interpreted this data in terms of a large density of electronic states associated with a one dimensional energy band and their work was published in Phys. Rev. Letters. Lonnie felt the Ti2O3 system was too isotropic for this explanation to be correct. So, to test this idea, he asked me to measure the electrical resistivity anisotropy. My measurements showed the material to be relatively isotropic, and therefore in apparent contradiction with Keesom's and Sjostrand's explanation. We then went on to calculate the electronic mass anisotropy using tight binding energy band theory. Amazingly, we got the same answer independently (at least I was amazed I got the correct answer)! Experiment and theory both argued for a nearly isotropic electronic system with a large density of electronic states at the Fermi energy.

I then moved on to another thesis topic–to try and develop electron tunneling as a means to explore the electronic density of states in transition metal oxides. These experiments were made by tunnelling through Schottky barriers on semiconducting transition metal oxides. The barriers stem from the space charge built up at the interface between the semiconductor and a metal contact on its surface. Despite constant encouragement from Lonnie and George, I became a little despondent over my lack of progress in this area. These experiments progressed quite slowly, as this technique was not

practiced at Purdue. One day I had quite enough of beating my head against the wall on this project. I went to Lonnie and told him "I quit"!!

We talked a long time about why I was upset. He listened patiently, but really didn't try to talk me out of leaving , he knew I couldn't quit! The next morning, I went back to his office and we decided that I needed some experience with Dr.'s R. Jaklevic and J. Lambe at Ford Motor Co. Research labs where Lonnie had worked before coming to Purdue. These two scientist were at the forefront of tunneling research and agreed to have me visit for a week. In that short time, I learned where I was making my mistakes and returned to Purdue rejuvenated and eager to finish my thesis.

In studying the Schottky barrier tunneling on the same V-doped Ti2O3 system where the specific heat anomaly had been observed previously, I discovered an interesting zero bias tunneling anomaly which I studied in some depth. At Prof. Overhauser's suggestion, Lonnie and I tried to fit the data in terms of elastic tunneling into a V impurity band pinned at the Fermi energy. The model successfully explained the V concentration dependence and temperature dependence of the tunneling data. Furthermore, the position and width of the impurity band were also consistent with the specific heat anomaly data. So– I was graduated!!!

Very recently (1994), I convinced Lonnie it was important to calculate the infrared dipole strength and Raman activity of intramolecular modes of C60 fullerene– an area in which I had been working with my students and post docs since 1990. In retrospect, I guess Lonnie and I had just come full circle in twenty years since my graduation from Purdue.....the student had just talked his professor into working on a problem. Prof. Saxena and Lonnie were working on the vibrational modes of C60 just before his death. I look forward to see the fruits of their collaboration shortly.

I would like to take this opportunity to thank all my teachers at Purdue University for providing me with the personal instruction I needed to carry out my own research elsewhere. Lonnie, in particular, was always there when I needed help. He was a very unassuming, brilliant guy. He was always glad to see me, always had a smile on his face, always made me want to do my best. I am sure he knows how much I appreciated his guidance.

ROBERT K. ADAIR

As with other good physicists, Lonnie Van Zandt spent his life as a scientist cementing a few stones in the construction of the cathedral of science and technology that will support our civilization a century from now. And only scholars, will note then, in a footnote here or there, just what part of the structure it was that Lonnie helped build. But the life we live is filled more with the richness of homely matters than with cathedrals, and I suspect that even a hundred years from now, when our grandchildren's grandchildren swing bats to hit baseballs as their forefathers did so long before, some will konw that it was Lonnie Van Zandt who taught us what happens when a bat meets a ball.

I first met Lonnie several years ago when Lonnie took me to lunch before I delivered a colloquium at Purdue on the physics of baseball. Over coffee, we talked a little about the action of a bat upon

hitting the ball. I had shown by some qualitative arguments that the bat could not be considered as a rigid body in striking the ball but, on the time scale of the bat-ball collision, the bat was flexible and vibrated — and those vibrations affected the striking of the ball. I mentioned that the general problem was surely complicated and difficult and that I was not competent to solve it.

But Lonnie, had the competence that I lacked and addressed the problem. And, after a few minor teething problems, developed an elegant and complete analysis of the action of the bat upon collision with a ball — an analysis that fit the frequency of the first 15 vibrational modes to 1%! In a letter I wrote to Lonnie dated May 20, 1991, I comment on the draft of the paper he sent me, calling it "your beautiful calculation." And beautiful it was. In my book on the physics of baseball, I call this calculation, reported in the American Journal of Physics in 1992, "the most elegant calculation in sports physics."

And so among the many legacies that Lonnie left behind, I hold the physics of the baseball bat is not the least — nor likely to be the least long-lived. After 2500 years we still celebrate the great poetry Pindar wrote about Greek athletics. I am sure that we will celebrate the very good physics that Lonnie Van Zandt addressed to athletics, for a long, long time.

RONALD G. REIFENBERGER

It is painful for us all to reflect on the loss of a good friend and colleague, Lonnie Van Zandt. In retrospect, many of the memorable times we shared together centered around everyday departmental events that seemed mundane at the time. Lonnie's keen sense of humor, the ever present critical thought process, the willingness to analyze some topic that most would let pass by - these are memories of Lonnie that will remain with us forever. Rather than recalling a few of these more memorable occasions, I think it more appropriate to recount the onset of Lonnie's interest in the physics of baseball.

I believe it all started during the spring of '89. At the time, Karl Van Zandt was finishing fifth grade and had just made the leap into the Bronco Baseball League. This transition is viewed by some as the sports equivalent of a religious coming of age, although I believe that overstates the importance of the event. I volunteered to manage a team that year and Karl, by the luck of the draft, was assigned to play on the team I managed. He was a solid first year player in the league, doing yeoman's work patrolling the outfield, filling in occasionally at third base, and thrilling his mom and dad when he connected with a pitch at the plate.

The Bronco baseball season is a long one in Tippecanoe County, providing ample opportunity for the manager to learn more about his players and his player's parents. From the cold spring workouts to the hot games played in steamy mid-July, the team came together and played good ball. It was during this time that I learned more about Lonnie, KC and Karl.

The team's parents provided a willing support group, helping as best they could whenever they could. As an example, I can still remember how Lonnie and I talked KC into keeping score for the team. Although initially reluctant, she was persuaded by our explanation that the scorekeeping process was somewhat akin to a Feynman diagram commonly used in theoretical physics. Instead of accounting for a fundamental process using

well-defined rules at the vertex of a Feynman diagram, the scorekeeper in baseball must keep track of the plays and players as the game unfolds, accounting in a shorthand way what happened according to the time-honored rules of baseball. I can recall peering into the stands from my vantage point as manager to see Lonnie and KC huddled together, scorebook in hand, discussing how to record the remarkable events that were happening before them. Together, they produced the best-kept scorebook I have ever seen in the County.

Good games in the Bronco league, just like good baseball at any level, are usually won or lost on a few close plays. Often a player is safe or out, a ball is caught or not - just by a matter of inches. This 'matter of inches' theme was one that seemed to fascinate Lonnie throughout the summer of '89. It was a slowly developing line of thought that we discussed between the inevitable rain delays, the conversations about physics, and the 'what if' analysis always conducted after a particularly close game. I can recall Lonnie frequently asking one question above all others: "I wonder how much a father would spend on a bat that would consistently add a few extra feet of travel to a batted ball? If such a bat could be designed, think of how many fathers would stand in line to buy one for their son!" As the father of three small boys, I had little difficulty in understanding exactly what he meant.

About one year after that memorable season ended, in August of '90 to be precise, I was present at the lunch that brought Robert Adair and Lonnie together. The occasion was an enjoyable one filled with talk of baseball, sports folklore and physics calculations. Adair commented about how little was known about the vibrational motion of a bat after it had struck a baseball. The brief discussion that followed surely focused Lonnie's efforts, leading to his famous analysis of the bat's vibrational modes which he published in 1991. Although many may trace the origin of Lonnie's calculation to that luncheon date, I believe the real motivation for the analysis took root during the summer of '89, when the Van Zandt family came together to watch their 11 year old son Karl play the great game of baseball.

SOLOMON GARTENHAUS

With the death of Lonnie Van Zandt the physics department has lost one of its most creative and insightful minds, his family has lost a loving and caring father-husband, and I have personally lost a very good friend. His office door—almost next to mine—was always open to his colleagues, students and to whoever wished to see him. The image I shall always carry of him, is the middle one of the three photos displayed outside of room 217 which shows him sitting with his wife KC with a smile on his face; the same kind of smile I would invariably see when walking past his office and seeing him conversing with one of his students or colleagues. It was always a pleasure to talk with him and to watch him bubble over with new and novel perspectives on things personal, physical and political.

Professionally, he was a condensed matter theorist and had the distinction, as you have heard, of having published a significant number of insightful researches in "related areas". Unfortunately he did not publish all of his insights. Once on hearing of the existence of a Purdue student club whose goal was to have its members colonize L4—one of the stable spacepoints known as LaGrange points of

the earth-moon system—he carried out an analysis and showed that although it is possible to colonize this point on physics grounds it is not feasible on economic ones. He estimated the cost at a prohibitive \$10-\$15 $\times 10^9$ per colonist! Another time, a few weeks following our discussing the lack of confidentially of e-mail messages, he showed me a secure crytographic system that he had devised and was using for communication with some members of his family. He was indeed a creative and unique individual with an uncanny ability to get to the core of any problem by viewing it from his own often very novel perspective.

But beyond that, he was also the kindest and gentlest soul of anyone I know. One of his last graduate students once told me she considered him more of a father than a major professor. He was a strong family man and obviously much appreciated by his children who while going to school would often drop by his office just to be with him and sit doing homework in a corner while Lonnie carried on his usual business. On several occasions one of them could be found sitting in the hallway waiting to be let into his office. One time I saw him carry a dewar of liquid nitrogen into his office and watched in fascination as he used it to treat a wart on a finger of one of his children.

His true nature is perhaps best demonstrated by the fact that he found the time to be a volunteer for the Tippecanoe Mental Health Association and used to help out regularly doing, among other things, the dishes and other cleaning tasks at the Lafayette Drop-in Center for Indigents. From any point of view Lonnie was a kind and gentle person who with his passing will leave an emptiness behind that will be difficult to fill.

TZEE-KE KUO

"I may not see you again," Lonnie had said calmly to me. It was evening when I went to see him, the last night before I was to leave for an extended trip. He passed away ten days later.

To see him become weaker and weaker, especially during the rapid last weeks — for me, that was the wretched part. But for Lonnie, those later days only served to display his unyielding serenity. He faced the most supreme of adversities with dignity, and his courage is truly admirable as he faced a new journey of his own.

Lonnie and I had known each other for almost thirty years. The bond between our two families developed gradually but surely. Together, we went to films, frequented restaurants, listened to classical music — or just sat around the living room and enjoyed each others' company. We would relax with one another.

This easy going demeanor was a hallmark of Lonnie's unswerving friendship. For instance, even though our views on politics were polar opposites, we managed to keep differences of opinion out of harm's way. "It is so hard to make friends these days, we are certainly not going to spoil our friendship over a petty thing like that," Lonnie had said.

But Lonnie also stood up for what he believed in. He was a doer. Although he was very much against the welfare system, he volunteered to work every Sunday at a Lafayette homeless shelter. Few people have such dedication to a worthy cause.

His body of knowledge matched his conviction. Lonnie was always our general consultant in things both scholarly and humble; whenever we had a question con-

cerning literature, history, medicine, cars, plumbing, or the New York Times crossword puzzle, Lonnie was always ready with an answer.

Lonnie was a good friend to a lot of people because he was...Lonnie. Humorous, stubborn, fiercely intellectual and wholly *genuine*, he left us so suddenly. *His* journey ended too abruptly. But his essence and spirit will not retreat with such brevity. The memory of Lonnie and our days together will remain with my family and me forever.

VIRENDRA K. SAXENA

It was the cold winter day of January 29, 1987 when I first met Professor Lonnie L. Van Zandt at the Purdue University Airport. My very first impression of Lonnie was that of a very gentle, caring, and helping person. From the very first day he was always a moral and professional support to me.

That day when I joined the physics department to work with him, I was not very confident about what I was going to do and had very little knowledge of the physics of DNA. By helping me to understand and learn the basic concept of the dynamics of DNA and discussing lots of new ideas in the field of biomolecular physics he became a strong source of self-confidence for me. During all those long sessions he showed great patience and always encouraged me. He was never bored or annoyed by my, sometimes very inane, queries.

He was not only my boss but a very close friend as well with whom I could talk as freely as with a family member. During the last eight years, we used to meet almost everyday, and on several occasions even many times in a day, mostly in the mornings and chatted over a variety of topics while sipping our coffee. We not only talked about physics but several other wordly matters. He had a curious interest and knowledge of various cultures and religions and it was wonderful to talk to him about these. Although we had very different political views it was a lot of fun to talk to him about the national or global politics.

Lonnie was the most lively, enthusiastic, and witty person I met in my life and he had a wonderful sense of humor. I very much enjoyed his dainty remarks and comments on the everyday life events and politics. From the time he was diagnosed with tumor he showed a lot of courage and hope. When he started the shark cartilage treatment we all had lots of hope and faith that he would be better, but unfortunately it did not turn out that way. It is a big loss for me. I miss him very much and my weekday mornings are not the same without him.

EPHRAIM FISCHBACH

Lonnie's untimely passing leaves a big void both for me personally and for the Purdue Physics Department as a whole. Lonnie brought to this work, and to our many conversations, a wonderful sense of irreverence — an ability to challenge authority and to poke fun at it when appropriate. He could with equal facility question the conventional view of the effects of carbon dioxide on global warming, and traditional ideas of how to make a good baseball bat. Since he was willing to stake out positions on issues that were not always popular (or poltically correct), he was on occasion on the receiving end of criticism, often at the hands of editors

and referees. We shared many laughs together as we considered whether his latest referee report or mine was the more absurd. Mostly what we did was to encourage each other, and for me his irreverent wit and self-deprecating sense of humor were a source of good cheer even in the darkest times.

Lonnie — I really miss you!

BRUCE GRIFFING

I was a graduate student at Purdue in the years 1972-79. Lonnie was my major professor. During that time I got to know Lonnie and came to like him a lot. I enjoyed his eccentric ways and unique sense of humor. Although my own personality is quite different, somehow we resonated. Over the course of my graduate career, we shared many experiences. The ones that I remember the most today are the personal ones - not involving physics, but things we did together.

One of my first recollections is of visiting Lonnie's house for the first time. Up to that time I had only seen Lonnie's in his office or around the physics building. His office was typical of the department - lots of piles of stuff on the desk and tables. Nothing special. I was amazed when I visited his house. It was clearly his creation and it was impressive. The entry made the biggest impression on me. Lots of plants - it reminded me of a small oriental garden. The entry set the tone for the whole house. Friendly, comfortable and unique. I was surprised.

At one point, Lonnie's mother decided to move from Boston to Lafayette. She planned to move into a house on Ferry street and I agreed to help unload the truck. It turned out that Lonnie's mother was a printer and we had to unload two printing presses among all the other household items. The presses were very heavy. I ended up on the downhill side of the ramp when we lowered the presses to the ground from the truck. Despite the weight, this would have been routine had it not been for the arguments between Lonnie and his mother about how it should be done. Lonnie's mother was intelligent, eccentric, and stubborn. She was a challenge for him to deal with. Although Lonnie was not just like his mother, it was clear she had a been a big influence on him.

Later Lonnie and I worked on the electronic controller for his mother's printing press. We had no diagrams, and it was difficult to repair. Knowing Lonnie as a theorist (and being an experimentalist myself), I had low expectations for Lonnie's abilities in this area. I was surprised again. Lonnie had a good sense of how to do this and he was able to work with his hands. We (mostly he) got it fixed.

Woodworking is an interest that Lonnie and I shared. Lonnie's home is filled with pieces that he had built, modified or refinished. After I got to know Lonnie, this is a topic we often discussed. A few weeks before Lonnie died, he showed me his collection of work. He was clearly proud of it Justifiably so.

After I left Purdue, I went to work for GE in Schenectady. A couple of years ago Lonnie came to the area for a conference. He had a free Saturday and asked if we could get together. I wanted to, but I already had a commitment to work on a service project at a camp for the handicapped. Lonnie agreed to come over and work with me on the project. I was pleased that he was willing to work on the

project. We spent the day building winter shutters for cabin windows. The procedure was to measure each window and custom build a shutter to that size. After successfully making several shutters, we became so involved in our discussion that we made one that was a gross misfit for the window - about 8" larger than the window. Lonnie had measured the window so I immediately began asking him about the theory of window measurements. We had a lot of fun that day.

On my last visit with Lonnie I noticed something about him. He seemed most comfortable at home. I don't think it was just because of his illness. I think it was because of his family. In reflecting on parties and events I attended at his house, it seemed to me that these were his happiest times. His home and his family were clearly very important to him.

GLENN S. EDWARDS

Thank you for the opportunity to share my memories of Lonnie Van Zandt. We knew each other for about a decade. We became close friends and for the past several years spoke, if e-mail can be referred to in such a manner, about once a week.

I came to know Lonnie and Earl Prohofsky through our common passion for understanding the vibrational dynamics of DNA. Back then I was a graduate student working with Chris Davis and Mays Swicord at the University of Maryland. Lonnie was a very thoughtful physicist and, at that time, an associate professor at Purdue. My favorite contribution from Lonnie is an article in Chemical Physics Letters 164, 82 (1989); in a sense it is so simple, but it reflects such a deep appreciation for what is really going on in nature and, as such, is an example of what is joyous in physics. If you look at the emerging research interest in biomaterials, history will show that Lonnie's contributions were ahead of the fashionable times. In addition, Lonnie's insights into DNA dynamics led to a better baseball bat, playfully referred to as the "phonon bat."

After my first presentation at an APS March Meeting, Lonnie invited a few people up to his room at Detroit's Renaissance Center. Still being a graduate student, I very much appreciated being accepted as a colleague. What a spectacular view as we toasted science with a glass of Vodka. This mentorship continued as I struggled to get established as an assistant professor at Vanderbilt. Lonnie was a source of wisdom as I came to know the vanities of academia.

Lonnie was a conservative Republican and I am liberal Democrat, at least as defined in the 60's and 70's; it led to good sport and a common sense of frustration with recent politics. On several occasions Lonnie visited Nashville to lobby for some very hard measurements. Several times I drove to Lafayette to debate theory. At the end of the day we'd compare the recent challenges of life. When my father committed suicide, Lonnie offered words of understanding and support. Then I got to know of Lonnie's religious conviction and love for his family. Several years later I was in the position to return the favor. His sense of humor never waned.

I have come to know that life can be a struggle. But with effort and friendships and possibly a little luck, our experiences can be lifted above drudgery into a truly rewarding time. Lonnie and I shared several of life's thresholds. Lonnie lifted my

life at times and will be missed.

JOHN KLOTZ

I feel very lucky to have known Lonnie. I only knew him for a couple of years but even in that short time we got to be good friends. I met Lonnie at the Purdue swimming pool where we swam laps and also liked to use the sauna - that's where we had our first discussion on ants. From that day on Lonnie called me "Leninger" or sometimes "Webfoot." I couldn't figure out why Leninger - but two years later he sent me a short story "Leninger and the ants" about this fellow in the tropics who waged an all out war against the onslaught of voracious driver ants.

Lonnie was a tremendous help to me in my ant research. I could just as well have been a post doc in physics with Lonnnie as in entomology. He helped me design experiments, instructed me on building Helmholz coils and he built me an electronic gizmo so that I could study the alarm behavior of carpenter ants to substrate vibration Then it was time for me to leave Purdue. But right before leaving I remember the night in late summer out in the woods on the outskirts of Lafayette showing Lonnie and KC how successful that gadget he built was in alarming carpenter ants.

After leaving Indiana I lost touch with Lonnie for several months until I ran across an article which reported the discovery of magnetic orientation in ants - I was excited because Lonnie and I had discussed this possibility and had even done some preliminary experiments while at Purdue. I sent the article to Lonnie and several days later received a letter: "John! Webfoot! Leninger! The article you sent was interesting, but very likely wrong and certainly inconclusive." And then Lonnie proceeded to outline what he didn't like about it. He ended by saying "Call. Write. E-mail. Don't waste another year waiting for Hillary to do the experiment for us." After that we kept a steady exchange of ideas by E-mail, which culminated in my visiting Purdue last year to collaborate with Lonnie and two other entomologists on a project concerning magnetic field sensitivity in ants.

From the beginning Lonnie was the project leader - not because he wanted that role but because we deferred leadership to him. We were out of our element. He knew exactly what we needed to do and how to go about accomplishing it.

Before I left for home that summer, Lonnie and KC took me out to dinner to a nice Chinese retaurant in Lafayette. Little did we know then that a year later we'd be having dinner together again at a Chinese restaurant, this time however in Bellview, FL. Lonnie, KC, Carl, and one of his friends had come down to Orlando for a short vacation and one evening we met Lonnie and KC halfway between Gainesville and Orlando for dinner. I remember after dinner that night on our way back to Gainesville, my wife, who had never met Lonnie or KC, asking me why I didn't have more friends like that.

Not even a year after that is when Lonnie told me about the illness he was battling. Shortly before he died I talked to Lonnie. He answered the phone in a shaky voice and said "What can I do for you lad?" I tried to tell him what a great friend he'd been, what an inspiration and how much I valued knowing him. I will miss his friendship and his mentorship but will always feel so much richer for having had the privelege of knowing him.