Ron Graham Celebration:
A Magical Day

Friday, December 10, 1999 -- a day that will be remembered, at least by many at AT&T Labs Research, as Ron Graham Day.

It was on that day that the Florham Park workplace world as most know it came to a halt and an extraordinary blending of good-natured jesting through testimonials, stimulating academic presentations, fellowship and masterful juggling created a day of ordered pandemonium – and memories. Some 200 colleagues, including pre-eminent mathematicians from around the country, family and friends shared what emcee-for-the-day Rob Calderbank heralded as "a celebration of the life and work of Ron Graham."

Effective December 31, 1999, Ron formally retired from AT&T after 37 years of distinguished service. To mark Ron's retirement and his contributions to AT&T and to mathematics, the Shannon Lab hosted a full day of events in his honor. The guest speakers included Persi Diaconis, Ron's collaborator on a book on math and magic, who spoke on The Magic of Ron Graham, while confounding the audience with card tricks that seemed to affirm the relationship between math and magic.

S. "Muthu" Muthukrishnan spoke on another recurring theme in Ron's life: airborne matters, as he addressed scheduling algorithms and Ron's work on the ABM Defense System and subsequently, related task sequencing projects. And Andy Granville flew up from the University of Georgia to review a variety of what Ron would term "delightful" math problems Andy had solved that he "didn't know were Ron's."

A host of colleagues shared fond memories and feelings for a man they consider a mentor, a friend and a tough act to follow. To Ron, though, his eclectic career seemed to make perfect sense. While acknowledging he had just experienced "an incredible day that was like a strange dream from a Kurt Vonnegut novel," he explained that math is a science where apparent chaos in time and space can be controlled – not unlike juggling.

"In math, you'll never solve all the problems – and in juggling, there's always one more ball to throw in the air," he mused. "Whether it's a math problem or juggling a ball in the air, the patterns are associated with mathematical sequences; I see them both as scheduling problems."

In addition to citing Ron's technical contributions, Rob Calderbank, who was hired by Ron, expressed sentiments repeated in a variety of ways by many of the day's speakers. "Ron exudes a joy in mathematics and a way of conveying math with excitement and intrigue that is infectious. And he's so human he makes everyone feel at ease." Rob recalled meeting Ron over 20 years ago,

before joining Bell Labs. "I remember thinking: If a research organization could have such a rare individual, I want to be there."

Labs Vice President Larry Rabiner added, "Ron has been very important in the history of the Labs, not only because of his work in discreet mathematics and scheduling, but because of his focus on fields that he didn't create, but was responsible for their flowering."

"He's also a unique person, a free spirit. His creative energy made the people around him better. Whether it was math or juggling, he would push the boundaries to get people to think and act out of the box."

The grand finale to the day's events featured The Dazzling Mills Family, jugglers headed by Morristown native Steve Mills, who met Ron when Ron was volunteering his time at the Morristown YMCA in the early 1970s. At age 14, Steve, then an admitted "goof-off," became captivated by Ron's love of trampoline and juggling and soon became more than just a star pupil; today, Steve, his wife, Carol, daughter Michelle, and son, Anthony Ronald – named after Ron – have become world-renowned entertainers, appearing regularly on cruise ships and television.

One of their most difficult assignments proved riding unicycles on the carpet before a standing room only audience in the Shannon Labs lobby – especially when Ron climbed aboard Steve's shoulders.

"Obviously, Ron is a brilliant mathematician," Steve said, an apparent understatement. "But I don't know the brain side of him." though he reported he has heard Ron lecture on math using a juggling analogy. In both cases, you have to break down the moves to the basics and build up from there. "All I know is that he likes to see people learning and will spend whatever time necessary to help someone achieve their full potential and do something a little better than anyone else."

During his "rebuttal" remarks, Ron confirmed impressions others had gained over the past 35-plus years. "It was always my philosophy to put people first. I got the greatest pleasure from seeing people develop, while I stayed out of the way."

He also took the opportunity to emphasize "what a special place" the Labs is. "To effectively solve problems you need the kind of interdisciplinary mix we have here, as opposed to the university environment, with its division of

disciplines. Here people – industry – can come to us with problems they really care about and we can develop solutions with the person whose problem it is. They buy into it and it becomes partly their solution, too."

As everyone bid Ron good wishes as he accepts his appointment to the Irwin and Joan Jacobs endowed chair in computer and information science at the University of California at San Diego, serves as treasurer of the National Academy of Sciences in Washington, hits more tennis, golf and ping pong balls, runs on the California beaches, reads, and promises to spend time at his Watching home, keeping his bungee-trampoline in good repair, one of this "retiree's" quotes kept ringing in the air: "The next two to the sixth power will be the tough one."

Ron Graham – A Biographical Retrospective
Provided by Larry Rabiner

Ron was born in California on October 31, 1935. He entered the University at

age 15, intending to pursue a career in science. After about a year at Chicago, he decided to transfer to the University of California at Berkeley and to major in electrical engineering. Eventually – after a four-year gap in which he joined the Air Force and was assigned to a post in Alaska – Ron finished his undergraduate education and received a B.S. degree in physics from the University of Alaska in 1958. Ron subsequently was awarded a Masters and a Ph.D. degree in mathematics from the University of California at Berkeley in 1961 and 1962, respectively. During his graduate years, Ron was both an NSF Fellow and a Woodrow Wilson Fellow. Interestingly, Ron worked his way through graduate school by performing in a circus with a trampoline troupe.

Ron joined AT&T Bell Labs in 1962, fresh from receiving his Ph.D. and worked, first, at Bell Labs and, most recently, at AT&T Labs, for all of his 37-year technical career. He rose from MTS to Department Head and ultimately to Director of the Mathematics Center at Bell Labs. For the first two years after the creation of AT&T Labs Research, Ron served as the first Vice President of the Information Sciences Research Lab. He was influential in attracting most of the people who initially joined this new lab and set the tone for the directions of the lab for the first two years of its existence. Ron turned over responsibility for this lab to Rob Calderbank in 1997, becoming the first Chief Scientist of AT&T Labs. Last fall, with the change in leadership of Research, Sandy Fraser became the Chief Scientist for AT&T Labs and Ron became the first Chief Scientist, Emeritus.

Ron has constantly renewed his ties with academia during his career and has spent significant time as a visiting professor at Princeton University, the California Institute of Technology, Stanford University, the University of California at Davis, and the University of California at Los Angeles. For the past year, Ron has been an adjunct professor at the University of California at La Jolla.

Over his 37-year technical career, Ron has made significant contributions to virtually every area of pure and applied mathematics. Ron is probably most well known for his work in Ramsey Theory, an odd branch of pure mathematics that has to do with finding unexpected order in apparently random mathematical situations. For example, if one arranges the numbers 1 through 101 in any random order, the theory guarantees that there will always be at least 11 numbers arranged in increasing order or at least 11 in decreasing order, so, to that extent, no arrangement is entirely random. Until recently, no one had found any application for results like this, but Ramsey theory is now being used in the design of data networks. For his work in Ramsey Theory, Ron was a co-recipient of the prestigious Polya Prize in Mathematics awarded by the Society for Industrial and Applied Mathematics.

Another important area of Ron's work is the practical problem associated with setting Private Line tariffs. In this work, he initiated a branch of mathematics that he called "worst case analysis". This work started when Ron tried to help out colleagues working on the antiballistic missile system (ABM). The problem being solved was that of scheduling a large number of interrelated tasks – in this case, identifying and locating fleets of incoming missiles. Ron showed that the order in which these tasks were performed made a crucial difference to the end result.

Ron is, without a doubt, one of the most well known mathematicians in the

world today. He is listed in the Guinness Book of Records for the use of the largest number ever in a mathematical proof. The unusual number, for which a new notation was required to represent the number, is, of course, known as the Graham number. He sits on the editorial boards of more than 20 mathematics journals, and travels and lectures extensively – and everywhere.

Ron is also a talented and dedicated juggler, and has been honored for his skills by the International Jugglers Association. He constantly works at improving his juggling technique, and was well known for having a net that hung from his office ceiling in Murray Hill that snared the occasional ball that "got away from him". In his younger years, Ron earned money as a trampoline acrobat, and he still stays in shape by bouncing and flipping on his home trampoline.

Ron delights in developing new skills, both mathematical and physical. He learned to bowl and rolled a couple of 300 games. He became an expert in throwing a perfect boomerang toss. He played ping-pong and became the Bell Labs champion (which is no small effort in the highly competitive environment that existed in Murray Hill). He learned how to parachute jump (and actually jumped from an airplane).

He studied for years and learned to speak fluent Chinese and even delivered an address in Chinese to Zhang Zemin, the premier of China, about two years ago. If all this were not enough, to top it all off, he became an accomplished piano player. When asked how he gets so much accomplished in his life, Ron – in his usual and mild mannered style – responded, "There are 168 hours in a week."

Ron's many contributions have been recognized by his election to the National Academy of Sciences, and by his Fellowships in the American Academy of Arts and Sciences, the New York Academy of Sciences, and the American Association for the Advancement of Science. Ron received the Carl Allendorfer Award of the Mathematics Association of America, the Lester Ford Award of the Mathematics Association of America, and the Euler Medal of the Institute of Combinatorics. He has also received three honorary doctoral degrees. Most recently, Ron was named a Fellow of the ACM, the Association for Computing Machinery.

Ron Graham has been a mainstay and a model citizen of Bell Labs, and now AT&T Labs, for 37 years. He has influenced and shaped the lives, both technical and personal, of many of us and we thank him for his many contributions to science, to mathematics, and to our personal lives. We wish Ron the best of luck in his new career as an academic at the University of California in San Diego. We look forward to hearing and reading about Ron's many new successes and accomplishments in the field of mathematics.