

# Mentoring For Success

Nurturing Minorities and Women for  
Engineering/Scientific Leadership

AT&T Learning Center  
Basking Ridge, New Jersey

Sponsored by AT&T and the University of Massachusetts  
In cooperation with the Council for Aid to Higher Education

# Contents

Contents.....	i
Preface.....	ii
Background.....	iii
AT&T Fellowship Directors.....	iv
AT&T Fellowship Program Committee.....	iv
Technical Leadership for the 21st Century.....	1
Mentoring - A Strategy for Success.....	9
Building Effective Mentoring Relationships.....	14
University Perspective.....	31
Keynote Address.....	49
AT&T Labs Outstanding Mentor Award.....	58
Symposium Speakers.....	62

# Preface

The Symposium “Mentoring for Success” was held on April 23, 1998 at the AT&T Learning Center in Basking Ridge, New Jersey. AT&T and the University of Massachusetts served as sponsors for the event. This record of the meeting presents some of the thoughts and approaches developed over the 25-years AT&T Labs and AT&T Bell Labs has been mentoring under-represented minorities and women to doctoral degrees in science and engineering. The longevity of the AT&T Labs Fellowship program and success of its alumni make it unique. The program has produced leaders in the sciences and engineering and has generated top level executives in major high-tech companies.

This document contains an edited transcript of some of the sessions at the symposium. Three sessions are not included in this document due to inadequate recording. They are:

**The Government Perspective - Encouraging Mentoring**

Dr. Wanda Ward, National Science Foundation

**Partnerships to Increase Representation**

Moderator: Dr. Hrair Aldermeshian, AT&T Labs

Dr. William Sibley, National Science Foundation

Marilyn Reznick, AT&T Foundation

Dr. Nan Snow, National Physical Sciences Consortium

Dr. Carol Muller, WEPAN

Dr. Jan Cuny, CRA

**Opportunities and Challenges in Creating Scientific and Engineering Leaders for Tomorrow**

Moderator: Patricia Wirth, AT&T Labs

We wish to especially acknowledge these speakers for their contributions. The work the organizing committee is also acknowledged.

It is hoped that the reflections of the speakers on past experiences and the audience questions on mentoring allow us all to mentor for success.

Dr. Patricia E. Wirth  
Director AT&T Labs  
Symposium Chair

# Background

The Cooperative Research Fellowship Program (CRFP) and its heritage of mentoring started in 1972 when Bell Laboratories was part of the AT&T Corporation. In 1975 the Graduate Research Program for Women (GRPW) was added to support the doctoral studies of future women scientists and engineers. AT&T has continued the fellowship and mentoring program since the divestiture of Lucent Technologies from AT&T renaming it the AT&T Labs Fellowship Program.<sup>1</sup>

This program aims to encourage the development of scientific and engineering research ability in women and minorities and increase the likelihood that outstanding women and minorities are successful in graduate school. Increased interaction with women and minorities in the sciences and engineering in a research setting heightens expectation for success.

Many graduates of this program have made distinguished careers for themselves in science and engineering. Approximately 200 students have been given both financial and mentoring support to pursue their studies, 65% of fellowship recipients have received their doctorates over the 25 years of the existence of the program while another 15% have received their Masters degrees. From 1978 to 1991, the program graduated 50 of the nation's 1,135 minority doctoral degree recipients in the major engineering/scientific fields of study. From 1988 to 1991, 14 of the 62 minorities in the nation receiving doctorates in electrical engineering were Fellows from these programs. Similar achievements have continued through the 1990's as AT&T has continued its commitment to this important area.

*"AT&T . . . can claim that 22% of all the minorities who have earned Ph.D.'s in electrical engineering in the past 20 years have been part of a program the company has sponsored. AT&T has helped 67 students earn Ph.D.'s by paying their graduate tuition giving them an annual stipend and summer employment, and setting them up with a mentor."*<sup>2</sup>

This program has been successful because it has combined the two necessary ingredients of financial support of qualified students pursuing their doctorates and personal interaction and mentoring of a practicing researcher. The AT&T Foundation provides the financial support to selected Fellows (educational expenses, living stipend, book allowance, etc.) while an AT&T Labs mentor is assigned to each Fellow giving the student the benefit of working with an experienced scientist.

The mentor is expected to provide professional, career and academic guidance to the fellow. To do so the mentor must monitor the fellow's academic and research performance. The mentor is also expected to open doors for the student and help improve the relationship between a student and a thesis advisor. Often he/she must also serve as an advocate for the student in professional settings and networks.

Adherence to these precepts is ensured through the efforts of the fellowship oversight committee composed of AT&T Labs professionals. These researchers focus on administering, monitoring and maintaining the quality of the program.

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<sup>1</sup> Lucent Technologies continues to support the CRFP and GRPW programs.

<sup>2</sup> Science, vol. 258 (13), pg. 1196, November 1992

## **AT&T Fellowship Directors**

Joseph Giordmaine	1972-1976
Arno Penzias	1976-1981
Paul Fleury	1981-1992
Alastair Glass <sup>3</sup>	1992-present
Michael Garey <sup>4</sup>	1990-present
Patricia Wirth	1996-present

## **AT&T Fellowship Program Committee**

Ward Whitt  
Charles Thompson  
Rodolfo Milito  
Ken Lyons  
David Johnson  
Pat Iannone  
William DuMouchel  
John Denker  
Alicia Abella  
Jackie Akinpelu  
Hrair Aldermeshian

### **Past Members**

Michael Merritt  
Mary Carol Day  
William Cohen

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<sup>3</sup> Lucent Technologies

<sup>4</sup> Lucent Technologies

# Technical Leadership for the 21st Century: Challenges and Goals

*Moderator:*

Dr. Richard Roca, VP, AT&T Labs

*Speakers:*

William Bulger, President, UMass  
Mozelle Thompson, Commissioner, FTC  
Dr. William A. Wulf, President, NAE  
C. Michael Armstrong, CEO, AT&T

*Coordinators:*

Dr. Patricia Wirth, AT&T Labs  
Dr. Hrair Aldermeshian, AT&T Labs



***William Bulger, University of Massachusetts***

I am pleased to be able to address and welcome you to this event that marks the 25<sup>th</sup> year of AT&T's commitment to graduate education for minority and women students in science and engineering. The impressive record of accomplishment of the alumni of the AT&T Fellowship programs speaks for itself. The graduates of its Fellowship programs have distinguished themselves as leaders in academia and industry. Our participation in this symposium celebrates and acknowledges AT&T's contribution in developing one of this nation's greatest untapped resources "its people".

I can say that the University of Massachusetts has been a beneficiary of their efforts. The Cooperative Research Fellowship Program and the Graduate Research Fellowship for Women has supported doctoral students at and has yielded faculty to the University of Massachusetts. Though these programs support underrepresented students in science and engineering, the scholastic excellence so well demonstrated by the participants of these programs heightens our aspiration for all our students. Attacking the stereotypes has done this, challenging our presumptions as to the capabilities of students from groups with which we have little experience.

Let this conference serve as a reminder that education does not only involve the conveying of information but also on the development of the tenets for life-long learning from one another. Traditionally an advisor or mentor lights the path toward this objective. The influence of a mentor in the success of a student is often underestimated and undervalued. There is a reason. The process involves a transfer of trust and respect between individuals. As such it's not easily quantifiable in terms some academics deem acceptable. However we know with it (mentoring) good things happen.

Our challenge in the discussions to follow is to determine how to best develop processes in our institutions that emulate the success of programs such as those undertaken by AT&T. To this end, I welcome your remarks and insights.



***Mozelle Thompson, Federal Trade  
Commission***

Good morning - I can tell I am with a bunch of academics. They actually respond. In Washington the response is sort of like a harrumph.

I want to thank you folks here at AT&T and University of Massachusetts Lowell for sponsoring this important program. I know that I am here in distinguished company. People who have made a difference and for AT&T a record of making a difference. This is an important conference because mentoring for success is especially critical for minorities and women in science and technology. Women and minorities have and continue to be under-represented in Science and Technology related disciplines.

I thought a good place to start might be to give you a little perspective on what I do and what my work is. I have been at the Federal Trade Commission since December '97. Prior to that I was doing domestic finance policy for the U.S. government at the Treasury Department. What I do at the Commission is look at the anti-trust policy. I think the people at AT&T know something about that. We also do consumer protection and for those of you, who also follow high tech a little bit, I am also heavily involved in electronic commerce issues including such things as privacy initiatives. Throughout the time I've been involved in Federal Government I have spent a lot of time looking at issues dealing with

competitiveness, markets and market sectors. I have also had the opportunity to take a look at how the U.S. compares with the rest of the world.

Now for those of you here I don't have to tell you that the world is changing and it is changing more rapidly than ever. Increasingly diversity is very important not only in how we deal with global markets but also in how we deal with people right here in the U.S. In many instances it starts with technology. Now the government can create the climate for change and competitiveness, but it is up to companies like AT&T to actually do it. It is up to the University of Massachusetts to train people to do it. Now AT&T should be commended for its past efforts, its contribution to science and substantial place in looking at the progress of Black, Latino and women representation in science and technology. I am here to tell you don't stop. The important question for AT&T and indeed for all of America is not what's happening now, but what's happening next.

Building strong mentoring programs that attract, nurture and support women and minorities in science and technology is not just fair it is good business. On an immediate scale it reflects the market for goods and services. For example, we need to start talking about fact and not myths: a lot of people don't realize 2/3 of African American families in the U.S. are middle class consumers. This program also says something about a company's commitment to finding and developing the best and the brightest. The Federal Government does regulate, direct, and make course corrections. However it is also a client for goods and services. When people talk to me about goods and services one of the questions I have is, do they come to me bringing the best and brightest. If they don't reach out, if they don't nurture, if they don't develop, those people who have great ideas but may not look like them or may not sound like them, then they are missing the best and brightest.

Now on a larger scale developing the best and brightest is good for America. It has enabled us to have the strongest and deepest

economy in the world. I have had an opportunity to reflect on various moments in my career that had a lasting impact. One such event occurred about four weeks ago. It was a social event, a dinner thrown by a friend of mine who is a Deputy General Council at Mobil Oil. At this dinner there was a small group of people who are friends or friends of friends. I was there with the Deputy Secretary of Commerce, the Chairman of the FCC, the General Council of HUD, a lawyer at a prominent Washington law firm, the chief Council to the National Cable Television Association, the former Ambassador in the Bush Administration at the State Department and the former Director of Legislature Affairs to the White House. It was a great social event where we went to trade notes and to talk about what we were doing. But what was significant about it once I left was that everybody in the room was African American. What was significant about it was all who were there were not in jobs where they make decisions only for African Americans but they made decisions for all Americans. I think that is what proper training and mentoring for these leadership roles is what your program is all about.

So I salute you on your commitment and for all of you who are involved in mentoring, those who recognize that it is about investment, one step at a time, one day at a time and everyday. Thank you very much.



***Dr. William A. Wulf, National Academy of Engineering***

Thank you very much. I too want to commend AT&T on the fellowship program they have run for the last 25 years. I have had the privilege to be associated with a number of the fellowship recipients. They are extraordinary people. As David Nagel<sup>5</sup> was up here talking about the success that the program has had, in fact, 25% or 22% of the minority graduates in some areas of mathematics and engineering come through that program, Mozelle Thompson leaned over and said to me, "it kind of makes you wonder where everybody else is." Think about what all the other companies can do; think about what the potential is for what could be done. I wish that a lot more people would imitate your programs.

It's pretty common these day to talk about under-representation of women and minorities as not just an equity issue but also a work force issue. I want to focus on that a little bit. To me there are actually two components. One is the numerical component. The observation that is frequently made is that early in the next century white males will be a minority of the population. Therefore to simply keep up with the number of people that we need in the engineering and science pool, we have to attract more women and minorities. That's a true statement, but I think there is another dimension which doesn't get enough emphasis and that's what I would like to talk about and that's quality. Equity,

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<sup>5</sup> President of AT&T Laboratories

quality and quantity are all-important social issues, but quality is what I want to focus on.

I am speaking here as an engineer myself. The engineering community had been making really pretty good progress through the latter part of the 80's and early 90's in attracting more women and minorities. Somehow over the last five years we seem to have hit a plateau. I think it is a plateau we have to break through. I want to give you a view of what I think engineering is. These statements perhaps will help me illuminate the point I want to make. I'm frankly going to go around the horn here. So you will have to put up with me a little bit because I want to tell you about what my definition of engineering is. Maybe I can elaborate a little bit on why it has been a fun career for me, then talk about why that has to do with the quality of the engineering workforce being so crucially dependent on more diverse composition and then get back to the issue of mentoring.

Let me make a contrast between science and engineering if I may. The business of science is to understand nature, to understand what is; the business of engineering is to build what can be. It is to synthesize that which can be. My own personal favorite definition of engineering, my short version, is design under constraint. What an engineer does is design, but that design has to satisfy a large number of constraints. I bristle when people talk about engineering being applied science. I bristle because nature, that which science illuminates, is one of the constraints under which an engineer works. But there are a huge number of other constraints. We have to satisfy certain functionality requirements while considering the economic and cost implications of what we do. We have to worry about safety, environmental concerns, and economic concerns and about a whole list of things usually such as reliability, maintainability, recycle-ability, etc.

I like this definition of engineering as design under constraint because it emphasizes the creative nature of engineering. To me engineering is a profoundly creative activity. This fact it is not communicated to young people very well.

One of the reasons I think we have difficulty recruiting from all communities, the male majority as well as the underrepresented groups, is that we don't communicate how much fun this is because it is so creative. I can't say that loudly enough, often enough or strongly enough: engineering is a profoundly creative activity. Our failure to communicate that has a lot to do with our recruiting problems. But there is a more important issue and that gets back to my quality thing. As with any creative activity I don't care whether you are talking about music composition, art or engineering, the output that you get is strongly a function of the life experiences of the people participating in the activity. To the extent that you have an engineering workforce who is not diverse it limits the set of designs that get considered: that ever gets postulated in the first place.

There is a wonderful ad that showed a woman trying to get out of a sport utility vehicle. She was wearing high heels and a fairly tight skirt and she couldn't get down from this tall vehicle. A woman would not have designed that vehicle. Indeed, I have come to be acquainted with a woman who is now in charge of chassis design for Ford Motor Company. She gave me example, after example, of how the American automobile has been designed for the 50-th percentile of males.

Engineering as a profession is impoverished by its under-representation. There are designs we don't consider; there are solutions that are never even thought of, the quality of engineering is less than it could be.

I think that this issue of creativity in engineering also relates deeply to the question of mentorship. David Nagel referred to, and I guess Richard Roca<sup>6</sup> referred to, the kind of personal aspects of mentoring. In fact the only way to educate anyone in creative activity is through an apprenticeship program. We don't know how to write down in a book how to be creative. I made these points to one of my National Academy of Engineering members the other day. An old curmudgeon, a bridge

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<sup>6</sup> VP of Advanced Technology, AT&T Laboratories

engineer as it turns out, harrumphed and said, “yes that’s right, but in fact I shouldn’t forget that design is sterile if designs aren’t reduced to practice”. I haven’t quite figured out how to fit that into my short definition just yet but he is absolutely right.

It also makes the point I think about one of the other satisfactions of engineering and that is some of the biggest buzzes I have ever had are when I see people actually use things that I designed. Again a thing we don’t communicate very well, and again a thing that relates very closely to the notion of mentoring, because again the reduction of practice is something we don’t know how to teach. So just coming back full circle. I wanted to stress that this issue of diversity is much more than an equality issue, it is even more than a numbers issue, it’s a quality issue.

In closing I am absolutely delighted that this pamphlet<sup>7</sup> showed up in your conference document package. This little book which I had a little bit to do in producing, comes out of the Academy complex and I strongly recommend it to you. I have given it to my entire faculty and all of you in academia I suggest you do the same. Thank You.



*Mike Armstrong, AT&T*

Thank you. Both good morning and congratulations. Thanks go to the fellows that are in the audience, current or graduated, and the mentors who are in the audience. I do think you had something to do with the program's accomplishment. Your accomplishments are something that I very much appreciate. Congratulations go to the program leaders, on this 25th anniversary. You have amassed a terrific track record and I am very proud of you.

People often ask me how does it feel to come from the West Coast, back east. I was with my granddaughter who was in our Manhattan Beach home. We were going to fly back east and that night I went to her bedroom and she was saying her prayers. She was saying “God bless mommy, daddy, grandma, grandpa, the aunts and uncles, the dog and,” she finally paused and looked up from the bed and said, “well god I guess this is good-bye, I’m moving to New Jersey tomorrow”.

I asked Richard Roca what he would like me to talk about because there is a wide range of subjects one could spell-off on here. He said, “talk about twelve minutes, that’s what you’ve got.” So I will really dispense with maybe a little bit of the philosophy. As Mozelle Thompson said, “it is up to some in the society to just do it”. I would like to spend a little bit of time about AT&T getting on with just doing it.

An article in the editorial section of the New York Times struck me as I came in this morning. It was on diversity. In fact it was on the Texas approach versus my state of

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<sup>7</sup> Adviser, Teacher, Role Model Friend: On Being a Mentor to Students in Science and Engineering, National Academy Press, Washington, DC, (1997)

California's approach to this subject currently. I thought that the final sentence spoke of a principle that I sure identify with. I assure you with my remaining remarks this company surely identifies with. That is access and diversity are not the enemies of excellence. Now what does it take to make that happen in practice? If you may let me, I will cover some things that I am currently engaging in with this company to make that statement reality.

The first principle I would put forward is that you would have to have a level playing field. Now what does a level playing field mean in a large institution like our company. First of all, as you plan for the future and you develop the only real asset that makes that future, people; that succession planning system and that diversity perspective of life is a single system. And so we will be folding into a single system, our diversity system and our succession system a single looking forwards training development and people planning system.

We are going to reach down from the director level and look at that population of people attempting to contribute and climb the ladder and actually build a ladder of success for each and everyone. So whether you've 25, 35 or 45 years of age, someone who thinks you have potential is identifying how to express the realization of that potential, mapping it against a ten year career ladder to achieve that ultimate goal and being tagged with the accountability to make that happen. Now not everybody will realize the potential, but everybody will be given a chance to get there.

Additionally, we need to put our money where our mouth is. We have a variable compensation system we call the bonus system. A part of that is people and in that will be our diversity mission. We will pay variable compensation for those who do that very well and develop the next generation and the future generations to pay our pensions and to lead our companies and those who don't do it so well will not get paid so well. I think the message will come across real clearly.

Often people create institutional bodies in order to mentor and monitor. We are not going to do that. In AT&T the top decision making group, the Operations Group which I chair, will hold itself accountable for the diversity and succession planning. We will review it not only annually within our business extensively, but we've gone to the board of directors and recommended that they review it as well. And of course the by-product of all that succession and diversity planning and the Operation Group reviewing it regularly is the springboard for what many of you have done which is mentoring.

I remember back when I started out in the IBM Company in the booming, metropolis of Muncie, Indiana. I want to share with you that there is an enormous potential for industrial expansion in Muncie, Indiana: selling punch card systems back in those days was a door to door event.

I was in field operations for something like ten years and had an opportunity to go up to Chicago, which was the "big-time" if, you're starting in Muncie. I was going to interview for a job as an executive assistant. The style of this executive was that the three finalists would go into his office together. He would ask a series of questions. This was not an easy-going man, in fact they called him laser-eyes, and he got to a certain question that I just felt very strongly about having to do with the marketplace and customers. We had the damndest argument you could imagine. I walked out and got on the plane. When I went home and sat down with my wife and said, "I blew it". Here I was, "the only opportunity that I knew I was ever going to get out of Muncie, Indiana, and we had the damndest argument, and forget about the job honey, I'm not sure we got the job we got." I didn't sleep that night. Of course, there was a good outcome the next morning; the call came from Chicago that he wanted me to be his executive assistant. I asked him when I went up to Chicago what had happened because we really didn't seem to hit it off and he said "I was looking for someone who had the courage to stand up and to be different."

Well you know, diversity is a lot about standing up and supporting people who are different than we are who have the courage to speak up and to get ahead. I thought as I was coming in here that mentor of mine, he didn't think of himself as a mentor, that boss of mine who pulled me up and out and said "hey that's OK to be different, you've got the courage to dissent and I'm going to reward that". That's the kind of company and the kind of system that this AT&T is going to have.

Second principle we are going to stand behind is that we listen to one another. We've got to have a dialogue with each other. I find that often if we don't listen and understand to the best and the brightest that are in this company we are never going to realize our potential. It is not only listening; it's doing something about what you hear. That's true whether you're listening to the marketplace in our customers, responding to our competitors, it might even be listening to the regulatory bodies that seem to have oversight and it is also true of each other, doing something about what we hear.

Third, unless we are in this just for practice, I ascribe to measuring how we succeed in the promotion, the development and the accomplishment of our best and brightest. We will be pro-active in that.

Finally many of you in the audience who are in AT&T know we are in the midst of getting ourselves competitive. We don't have any strategy in the back room of Basking Ridge<sup>8</sup> that shows how we will prevail in the market place if we don't have a cost competitive company. In doing such we are going through a considerable downsizing. In that downsizing I have made it very clear that this company will have a policy that downsizing will be in balance with the great diversity progress that we have made so far. I can sum up in one sentence what I would hope in five or six years from now, when they retire me, what we would have accomplished during this time frame. That this company remains and even improves on

being a great place to work where everybody has a fair shot at realizing their dreams. Thanks and good luck.

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<sup>8</sup> Basking Ridge, NJ location of AT&T Headquarters

## Mentoring - A Strategy for Success

*Speaker:*

Dr. Mirian Graddick, AT&T VP, CRFP '76

*Coordinator:*

Dr. Michael Merritt, AT&T Labs



***Dr. Mirian Graddick, AT&T***

Thank you. I am absolutely delighted to have the opportunity to participate in this symposium on mentoring today and to share some of my personal experience with regards to mentoring. A couple of months ago individuals from AT&T Labs asked if I would get up and talk about some of my experiences, particularly as a former Cooperative Research Fellow. I thought to myself, "Oh my goodness that was over twenty years ago; how in the world can I step back and recall some of the critical events that took place in a vivid way." I sat and reflected on some of the experiences that I had, particularly many of the initial experiences at Bell Laboratories. I realized that those experiences had tremendous impact on influencing my hopes, my dreams, and my aspirations. I realized that even though many of those experiences were over twenty years ago they are definitely forever etched in my memory.

About five years ago I received the Katherine Cleary Award, it's the woman of the year award at AT&T. One of the things you are afforded is the opportunity to go in front of the Board of Directors and give a very short speech. I found myself referring to my early years at Bell Labs as a summer research student. I talked about the impact that those experiences had on my career. They really set the stage for the position that I have today.

What I would like to do during the next few minutes is to share my personal story about some of the experiences that I have had. I am going to focus on some of my earlier experiences because those are the most memorable. They have influenced my decisions and the direction I have taken in my career and my life. I will conclude my remarks with my philosophy on mentoring.

Before I get started with my formal remarks, let me say that I am very fortunate today in that the individual who served as my mentor for my first summer experience back in 1974 when I was summer research student at Bell Laboratories is in the audience today. He remained my mentor throughout my graduate career until I received my Ph.D. I would like to introduce to the group my dear friend and mentor Peter Bricker. Peter actually flew in last night and he stayed at my house. He had an opportunity to spend some time with my kids. After I put the kids to bed we sat and reflected on some of our experiences. One of the things we were trying to do was to remember some of the first research projects that we worked on back in that first summer. Between the two of us we were able to piece together at least four experiments we had put together in partnership.

I still remember the summer of 1974 when I was first recruited to Bell Laboratories. It is actually a somewhat funny story. I was an undergraduate, between my sophomore and junior year at Hampton University. I was on my way to an interview with NASA for a summer job in the Human Factors Department. At the

career fair I happened to walk into the wrong door. After about ten minutes I realized they weren't talking about research opportunities at NASA, but rather research opportunities at Bell Laboratories. At that point I was too embarrassed to get up and leave the room. So I stayed for the discussion and completed an application.

One of the reasons I did apply was because of a gentleman some of you in the room know, Jim West, who is a physicist at Bell Labs. He did an absolutely outstanding job of describing what it would be like spending a summer doing research at Bell Labs. He painted such a compelling picture of how fun it would be and what the opportunities would be like to learn. So shortly thereafter both NASA and Bell Labs informed me that I had been accepted into their summer programs. (I did eventually get to the NASA room to fill out an application.)

Not long after that I received a call from my mentor Peter. He called to tell me that he was going to be my mentor for the summer. I still remember the excitement and enthusiasm in his voice and how truly delighted he was to serve as my mentor. There was no doubt in my mind that he really wanted to be a mentor and I have come to appreciate how important that is.

Serving as a mentor is a very personal decision. People have to really want to take on that responsibility and do it with a fair amount of energy and commitment. In fact it was that phone call from Peter that was the reason for my deciding to come and spend the summer at Bell Labs.

So off I headed to Murray Hill for the summer and I think like many other summer research students I was very excited, but also a little bit scared. My dad was an Air Force pilot so I wasn't so much scared about moving to another location for the summer and meeting new people. We had moved around every four years. I had no idea of what it would be like to work in a large research lab and to be surrounded by very world-renowned scientists whose work you read about in very prestigious journals.

I was excited about the opportunity to explore, to learn, and to grow. I still remember the first day the bus picked up all the students at Rutgers University. In fact there are a couple of people sitting in the audience today that were on that bus with me twenty years ago. I remember as we pulled up into the complex at Murray Hill all the oohing and aahing you heard on the bus. We were like a bunch of kids taken to New York City for the first time. For those of you who have not seen Bell Laboratories it is an enormous complex.

Once we got inside the building it was equally impressive. There were large research labs everywhere; there were wings to halls that looked like they went on endlessly. As many of us peered through the windows of the laboratories we could see research scientists in their white lab coats conducting their research. I finally met Peter in person; we had spoken by phone several times. There he was standing with a big smile on his face and greeted me with an enormous amount of warmth and enthusiasm. I felt my anxiety level instantly dissipate.

Peter and I worked together extremely well. He taught me how to design research experiments primarily in the area of interpersonal communication research. We had an opportunity to build and tear down labs. In fact during one of my summers at Bell Laboratories we actually moved to another building so I got a chance to experience what it was like to take a lab down and put it back together. We analyzed and interpreted data together. We prepared written reports. Finally one of the really valuable things about this summer research program was we had an opportunity to summarize our research and present an oral report, not only to the other students but also the research scientists.

One of the things I remember most about Peter, particularly that summer was that he is a very gifted writer. I remember having to swallow my pride many times as he pulled his red pen out to edit some of my reports. While it was often painful, what he taught

me was that it wasn't just sufficient to design a great experiment, but you had to learn how to communicate your results effectively whether it was verbally or in print. These are skills that have been very important to me throughout my career. Over time I came to appreciate the red ink marks and editorial comments from Peter. What I most appreciated was how he coached me as a mentor. He was very good at encouraging me and building up my self-esteem while at the same time giving me very critical feedback and input to help me grow and expand my skills and that is always a very difficult balance.

Peter was also great about exposing me to a lot of different people, lots of other research scientists and he encouraged me to learn from other people. Each day I became more and more like Curious George, asking lots of questions and soaking up information like a sponge. I had the opportunity to meet some terrific role models like Shirley Jackson, whom many of you know. She was the first African American female to receive her Ph.D. in Physics at MIT.

While Peter and I became buddies on the job, he also opened up his home and allowed me to build a relationship with his family. After hours Peter was an avid trombone player and he took me to several of his concerts that he had during the summer, though at the time I liked rhythm and blues music. He taught me to appreciate a variety of different styles of music. The relationship went well beyond just the work setting and I think that is very, very important.

People experience traumas throughout their careers and I had one in between my junior and senior year. My mother was killed in a car accident. For those of you who have experienced trauma like that it is very easy to lose your focus. One of the things that Peter probably never realized is that he was one of the constants in my life during that time. Knowing that he was there, I could stay focused on some of the things that I was really excited about doing.

What I learned is that the several summers I worked at Bell Laboratories truly

changed my life forever. My confidence and self-esteem expanded tremendously. I proved to myself that I could get up in front of large groups of people and give presentations, which is one of the things you get taught in the summer research program. I developed a strong appreciation for science and technology and began to realize that it was possible for women and minorities to enter and be successful in these disciplines. My aspirations grew enormously as I began to realize the possibilities of my own career.

After several summers at Bell Laboratories and spending about a year as a research assistant I then entered the Cooperative Research Fellowship Program. Peter was involved in encouraging me to apply to the CRFP program. He helped me to select my graduate program, and again was quite eager to volunteer to serve as my mentor throughout my graduate school experience. Entering graduate school at Penn State University was another somewhat scary experience. Going from a very small, primarily African American University in Hampton, Virginia, to a huge university was a tough transition for me. One of the very important tasks that I had at that time was to make sure that I built strong partnerships and developed mentors at the university. I could not only rely on my relationship with Peter as a mentor to get me through graduate school. I ended up developing an outstanding relationship with several of my professors. In fact I still stay in touch with them, but somehow Peter was able to play a critical role in my graduate training as well.

I conducted all of my research for both my Masters thesis and my Ph.D. thesis at Bell Laboratories. We were able to form a very neat partnership between the university faculty mentors that I had and with Peter. Even though he was very good about giving me the space that I needed to develop relationships at the university I always knew he was but a phone call away as problems arose. I had few, but when I needed him he was always there.

So in conclusion I would like to say that while the financial support was extremely helpful, and very, very much appreciated, I strongly believe that the mentoring aspect of the program really has had the most significant impact on my success. It's so nice to know that individuals who provide you with confidence, strength and renewal surround you. It is very easy, as many of you in the room who attended a five-year graduate program know, to become discouraged and at times overwhelmed.

Throughout my career I've broadened my concept of mentoring a bit. It's interesting because as you pulled out the book and brochure I think the way I view mentoring now is very much the way described in the book. I really think there are four critical components around mentoring.

The first role is that of a mentor, and these are generally people with whom you do form longer term, very close knit relationships. I believe very strongly that mentors can have the most impact early in ones career, even back to children. I think there is someone attending today from the Plainsfield, NJ school system that is working on mentoring programs with children. I think having a mentor early enough so you can influence decisions that people make and directions that people take in their life are very critical.

A sponsor or an advocate, is a person that you may or may not know that well and may or may not have a close relationship with. They are people who may have had some exposure to you and are willing at particular points of time in your career to pick up a phone for example and make a phone call for you. They often times make the difference in your getting into a strategic position or getting access to a particular assignment or project.

Role models are always very important. It's always nice, particularly as a minority, to be able to see others in critical positions and making significant contributions. What it does is that it opens up the realm of

possibilities that you begin to consider for yourself.

Finally there is this role of coach and counselor. This could be a friend, a peer, a colleague but it is somebody who is willing to take the time and coach you and often times give you the very critical feedback that all of us need throughout our career to help us grow and learn. Now in some lucky cases you can find one individual that can play all of those roles. More often than not, however, over a course of a career there will be several people who will play different roles. For women and minorities particularly those who seek out careers in non-traditional disciplines developing and nurturing all of these kinds of different relationships are absolutely critical for success.

So in closing since I was recently reunited with Peter, I thought I would tell a quick story. Peter and his wife, after he retired from the Labs sold his home in Livingston and lived on a boat for many years. For a while we lost touch and actually reunited last year when we went down and spent some time with him. He had an opportunity to meet my children and spend a couple of days. We had some really quality time to talk about what's been happening in his life and what's been happening in my life. I found myself throughout those three or four days trying to find out different ways to express to him how much I had appreciated what he had done for me and what an impact he had had on where I am today. He kept saying how proud he was of where I was. I kept saying but I don't think you have any idea how much of an impact you had on where I am today. So when we left his house we had an opportunity to take some pictures. I took one of the pictures of all of us with his wife and my family and put together a plaque and decided to just write something that expressed how I felt. Now that was risky because as I mentioned before, Peter is a very gifted writer, and I am not one who is in to writing poems and things like that. But I told him to not think of it necessarily from

an editorial standpoint but that this was something that truly came from the heart. The plaque was a little bit too big for him to bring back on the airplane but what I said was I called it a special person and I had a picture of all of us:

*A special person is someone who is sincere and trustworthy.*

*A special person is someone who gives from the heart.*

*A special person takes the time to coach and develop others by giving constructive feedback and allowing people to learn from their mistakes.*

*A special person helps restore a person's confidence and self-esteem when they have lost the ability to energize themselves.*

*A special person reaches out to those who are far less fortunate and helps them through the journey through life.*

*A special person is never perfect but they do the best they can with the gifts that god has given them*

I have been incredibly fortunate in my career in that I had a mentor who as I described was a very, very special person to me. I hope that through some of this personal testimonial that you would have gained an appreciation for the impact and the role that mentoring can have on an individual's career. Thank you.

## Building Effective Mentoring Relationships

*Moderator:*

Dr. Carl A. Spight, Chief Scientist, Jackson &Tull  
Academic advisor to CRFP 1975-1990

*Panel of Mentors and Mentees of CRFP/GRPW*

Dr. David Berkley, AT&T Labs  
Professor Charles Thompson, UMass , CRFP '76  
Dr. Albert Greenberg, AT&T Labs  
Dr. Jennifer Rexford, AT&T Labs, GRPW '92  
Dr. James McKenna, Bellcore, (retired)  
Dr. William Massey, Bell Labs, CRFP '77  
Professor Arlie Petters, Princeton, CRFP '86  
Professor Anthony Johnson, NJIT, CRFP '75  
Dr. Carlton Truesdale, Corning Inc., CRFP '75

*Coordinator:*

*Dr. Michael Merritt, AT&T Labs*

***Michael Merritt, AT&T Labs***

The next part of the program is a more interactive one. We have a panel of alumni from the fellowship program and their mentors. To coordinate that panel and help lead the discussion, we are very pleased to have Dr. Carl Spight. Dr. Spight is currently the Chief Scientist of Jackson & Tull and served as academic advisor to the Cooperative Research Fellowship Program for 15 years starting in the very early years of the inception of the program. He played a key role in developing the firm foundation that this program enjoys. He will be leading the discussion and inviting questions and comments from the audience. Carl.



***Moderator: Dr. Carl Spight, Jackson & Tull***

Thank you Mike. You can see this particular session will have a number of participants who are seated at the table. I will also invite comments from the audience. These comments will be from those who were mentors or who were recipients of mentorship, mentees as we call them.

My history with the programs goes back to 1975. I do want to say a few things in connection with the start of the program. Sidney Millman<sup>9</sup> and Joel Burton<sup>10</sup> were some of the early Bell Labs directors who were key in creating the program that we are now celebrating here after 25 years. There is another name that Mirian Gradick invoked earlier and that is Jim West<sup>11</sup>. If I had my wish I would have wanted to see Jim here today. He is a member of the Technical staff at Bell Labs and a key person in helping to guide and define leadership for the program. He was a mentor-at-large of a kind and certainly is one of the spiritual giants of this program. So I invoke the name Jim West here.

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<sup>9</sup> Sidney Millman, Executive Director of Research, Bell Laboratories 1965-72 (retired)

<sup>10</sup> Joel Burton, Executive Director, Bell Laboratories (retired)

<sup>11</sup> James E. West, Distinguished Member of Technical Staff, Bell Laboratories, Lucent Technologies

I want to spend just a few more minutes, and again taking certain liberty as moderator, to talk about this notion of *complexion*. I am using that word in a way that Kenneth R. Manning, Professor of History of Science and Technology at MIT, uses the notion in his many public comments. He uses *complexion* to talk about not only the color but also the taste and the sound of science when you have diversity and complexity, in the dynamical system sense, involved in the endeavor. As it has been pointed out earlier by Dr. Wulf, there is a possibility that a certain kind of impoverishment can occur in its absence.

Our dealings with uncertainty, risk taking and the vitality generated by the process, is what we celebrate here in reflection. Our discussions will hopefully motivate and challenge us as we look toward the future of these kinds of relationships.

We have history here, mentor and mentee relationships. We are going to have a chance to witness here and I think to understand what such activities mean in the creation of the science and technology that is so vital to the future of all of us. So we will be visiting the status of where we are at this particular point and how we are where we are. The particular timing of this event is rather interesting given the current thinking going on with respect to affirmative action and related issues.

Now I will move to my moderator role. I wish to acknowledge our panel. I think what we will do, if you will allow me, is to allow those of you on the panel to make comments. I invite you to say something about your relationship with your mentor or mentee. The idea here is to make a few minutes of comments just to orient and arm the audience to know the relationship you have with your mentee or mentor. Then we are going to quickly move to a mode where questions and comments from the audience are certainly expected. So David if we will start will you. Hopefully you will set a context and Charles will pick up as a former mentee.



***Dr. David Berkley, AT&T Labs***

Charles and I are one of the early, mentor/mentee pairs in what was then the CRFP program. I think Charles when he came to the program was clearly one of the people who was going to succeed in the program. But there was nothing going to be easy about it, either for him in terms of the academic aspects of what he did or for me in terms of guiding him in a new technical area. His area has become now a fairly well understood field. At that point in time we were breaking new ground. I think there were a lot of well meaning people at the University he attended. There were also a lot of people who had no idea of how the actual the program study was going to be undertaken. It was exciting and, as I've said to several people, Charles has gone on to fame and fortune, or at least fame, well deserved. It has been one of the pleasures of my life to watch that happen.

***Dr. Charles Thompson, UMass/Lowell***

In the program mentor and mentee pairing is done by mutual agreement. We pick one another.

David Berkley was, of course, my mentor. During my graduate education, I was not aware of the trouble that I was in. I think David and Carl Spight were aware and I think they were very comforting and supportive of me. I secretly think when I left the room they were wondering if I was going to make it or not.

I recognize from this experience that the process was a personal one and that his intervention and interaction made the difference in my being successful. Now twenty years later we can all say it was a forgone conclusion that this guy was going to be successful. I think that in real-time there were various points in the process where we had to decide to either bail or continue. I think an important observation is that we are not good predictors in real-time of the success of a student. We often underestimate in some ways what our role is in making a student move in a positive direction toward long term success.



***Dr. Albert Greenberg, AT&T Labs***

I first met Jennifer in the SRP program. She then won a fellowship in the GRPW program for women and worked with me as her mentor. It was a fantastic opportunity for me. I learned a lot from Jennifer. We put together some sort of team with others to pursue the answer to technical questions over rather long summers. These extended summers were three or four months long. This was done because we were so excited about the work. I think it is a fantastic program. I know that the program made an impact on Jennifer's thesis and the papers we published. In addition we created relationships in Bell Labs. We are still working with these people. We also started relationships with other industries that we are continuing building on. In terms of the mentor/mentee relationship, the program brings a different aspect to educational process that is just not available in the

University system. If you bring that out it strengthens the university system and also us. So I think we all learned a lot from it.

***Dr. Jennifer Rexford, AT&T Labs***

I worked at Bell Labs in the summer research program in 1990. I just have one short story. When I first started I was 20 and incredibly confused about what it is to do research and how to demystify, what is the cadence of how researcher interact with one another. I had a great experience my second week at Bell Labs. I heard Brian Kernighan was giving away free copies of his C-Programming book. It was the second edition of the book. I was fascinated and a little bit terrified by the prospect of meeting Brian Kernighan. So I went and tapped on his door and asked very timidly "are you Dr. Kernighan?" He bounded across the room, shook my hand and said "NO". He then put on a more gentle face and said "but I am Brian." I made a mental note at that time to use people's first name. So the program was great for demystifying the whole process by which research is done and how technology transfer is done. It got me hooked on the idea of doing industrial research because of the opportunities to interact with development groups and do scholarly scientific work. I have now been doing that full-time for a year and a half. I see it now as a natural extension of the experiences I had in the summers and the relationships developed.

***Moderator: Dr. Carl A. Spight***

It occurs to me that I needed to do something in looking at the panel here because I know that Charles Thompson, and I suspect Bill Massey, both will not tell you some important things about the particular character of their role now in the program. First of all Charles Thompson is kind of an inheritor of a role I had and perhaps redefined that role for the last few years, 8 or so, I am not sure of the number. He is the person that serves as a kind of mentor of mentors and a mentor of mentees at large in

the program itself and he has given in a very rich and generous way. Bill Massey has been doing the same. Not only was he a mentee in the program but he continues to serve on the various advisory committees. He is a very powerful champion of the interests of the programs. I know they wouldn't say this so again I am taking the liberty.



***Dr. James McKenna, Bellcore (retired)***

I can certainly say that when I was at Bell Labs my participation in the CRFP and GRPW programs, I think were the things I am most proud of in all the things I've done. Certainly these activities have given me the most pleasure over my life. I think they were just terrific. In fact I know that much has been made here of the value to the mentee in the system. I would like to turn it around and say that as a mentor I probably gained a lot more than I gave to it. It enriched my life in many, many ways both professionally and personally and I am just thankful that I got involved in it.

I mentored two students in the program, Bill Massey who was my first, and Andrea Patriarcha who is not here with us; she was in the GRPW program. Both have gone on to have marvelous careers. I personally and secretly believe they both would have done it completely without me. It was my pleasure to be there and to watch them both grow and develop professionally and personally. It has really been a marvelous thing. I can also remember the day when Bill showed up and told me that Arlie

Petters was on the scene. Bill was all fired up about that and we spent a lot of time about getting Arlie into the program and, well, here he is sitting next to me today. I recommend to everybody if you ever get a chance in any setting to be a mentor, well snap it up. It will be an experience that you will appreciate and profit from for a long, long time. Hopefully a little bit later on I will be able to comment on what I think are some of the values to an individual and the corporations of this program which I think extend well beyond the original intent of the program.



***Dr. William Massey, Lucent Technologies***

I would just like to mention something that I learned in my career as a mathematician at Bell Labs. The numbers are important. It is one thing to say out of the two hundred alumni from the program about 48 are university professors. Its one thing to say it but it is another thing to see it. Table 1. Here you have every university listed where there are women or minority faculty members that are a product of this program. This is the tip of the iceberg, this is just in the academic realm. In particular, take Arlie Petters. Arlie is one of the first African American mathematics professors at Princeton and this is a product of the program. So it is a way of giving you a sense of the impact of what the program is all about.

I want to mention something about my relationship with Jim McKenna. We started about, I would like to say, two AT&T breakups ago. I was finishing up at Princeton in '77, and while it might be true I may have gone on and gotten a Ph.D. in mathematics anyway, it definitely would not have been true that I would have done my Ph.D. research in Queuing Theory. When I was an undergraduate I focused primarily on algebra, algebraic number theory. Going to Bell Labs was like going to a new world. I had no idea what industrial research was. When I was there Jim had introduced me to John Morrison my first summer and the research work we did over the summer resulted in a paper. I got my first publication in the Bell Labs Technical Journal. I just found this incredible. I hadn't even started graduate school yet and I was doing research.

**Table 1: CRFP/GRPW Alumni in Academia**

Armando Rodrigues, Arizona State University, CRFP, '83
Charles Thompson, UMass Lowell, CRFP, '76
Stephen Mayo, California Institute of Technology, CRFP '83
Magaret M. Fleck, Harvey Mudd College, GRPW
Cecilia Conrad Miller, Pomona College, CRFP '76
Bruce Ducan, UCSD, CRFP '84
Ralph Aldredge, UC-Davis, CRFP '85
Shirley Chiang, UC-Davis, GRPW
Clare Yu, UC-Davis, GRPW
Michael Burns, Colorado College, CRFP '73
Karin Rabe, Yale University, GRPW
Deidre Williams, Florida A&M University, CRFP '88
Carlos Handy, Clark Atlanta University, CRFP '72
Iris Mack, Clark Atlanta University, CRFP '78
Michael Williams, Clark Atlanta University, CRFP '80
Gary May, Georgia Institute of Technology, CRFP '86
Sidney Harris, Georgia State University, CRFP '74
John Foster, Morehouse College, CRFP '79
Theresa Edwards, Spelman College, CRFP '76
Willetta Greene-Johnson, Loyola University, CRFP '79
Janet Rutledge, Northwestern University, CRFP '83
Robert Gooden, Southern University, CRFP '74
Elizabeth H. Simmons, Boston University, GRPW
Catherine Hirshfield Crouch, Harvard University, GRPW
Michel Degraff, MIT, CRFP '86
Kaye Husbands, Williams College, CRFP '81
Kim Brown, U of Maryland at College Park, CRFP '90
Duane Cooper, U of Maryland at College Park, CRFP '83
Rhonda Williams, U of Maryland at College Park, CRFP '78
Gregory Wilkins, Morgan State University, CRFP '85
Walter Lowe, Howard University, CRFP '77
Donnell Walton, Howard University, CRFP '89
Anthony Johnson, NJIT, CRFP '74
Helen Buettner, Rutgers University, GRPW
Christopher Rose, Rutgers University, CRFP '79
Phillip DeLeon, New Mexico State University, CRFP '90
Barbara H. Cooper, Cornell University, GRPW
Kevin Kornegay, Cornell University, CRFP '86
Lisa Hellerstein, Polytechnic University, GRPW
Andrea Bertozzi, Duke University, GRPW
Theda Daniels-Race, Duke University, CRFP '84
Arlie Petters, Princeton University, CRFP '86
Alvin Kennedy, North Carolina A&T University, CRFP '78
Michael Smith, Carnegie Mellon University, CRFP '91
Lance Collins, Pennsylvania State University, CRFP '81
Ofodike Ezekoye, University of Texas at Austin, CRFP '87
Anthony Teate, James Madison University, CRFP '76
Julia W. P. Hsu, University of Virginia, GRPW
Damon Tull, University of Wisconsin at Madison, CRFP '93

When I later became a mentor at Bell Labs, I tried to impart to students the opportunity to do state-of-the-art research. Of my 40 publications, 7 of them are co-authored with minority students who I worked with during my various summers at Bell Labs. These students were either in the fellowship program or the undergraduate program. So it really gives students a great opportunity to see what research is like. Summers at Bell Labs, any summer student can tell you, they are never make-work

summers. You get to do state-of-the-art research.

Now about Arlie Petters. Carl Spight gave me Arlie Petters resume. Arlie was an undergraduate at Hunter College at the time. I was looking over the resume. OK - he took calculus, differential equations and then he did a reading course on Clifford Algebras. I said, wait a minute Clifford Algebras? That is not the typical subject in an undergraduate math curriculum. From this I realized that he was committed to the technical issues in cosmology and general relativity. I remember interviewing him on aspects of differential geometry.

In terms of being a mentor I realized that in dealing with Arlie the only issue was just getting him past the qualifying exams. After that it was very clear he was home-free. Well I am just amazed at his success. He was about to go to graduate school at MIT and I realized they don't play games at MIT, as many people can tell you. It was important to help him along but also be very hard on him because I knew that MIT was hard. I felt that I had to give him a taste, for better or worse, of what was coming just so he would be familiar with it and know what he had to face. So with that I will stop here and let Arlie talk more about it.

***Dr. Arlie Petters, Princeton University***

Well I think Bill is being rather modest in this story and I thank him for his kind words. I should say that the later parts of Bill's remarks are extremely crucial in my development. From the beginning Bill said excellence is the bottom line. There is no way one is going to sacrifice excellence. You may note that coming from Hunter College is not the same thing as coming from MIT. So being a star at Hunter College is one thing but you are ordinary when you step foot into MIT And he made sure that when I entered MIT I would be solid. Bill put me at the blackboard, asked me questions, some of the questions I fell apart on them, but I knew he was there not to hurt me but to help me. I think that as a mentor Bill enabled me, over my first two

years at MIT, to fill in basically every gap that I had in my background. This enabled me in the final analysis to have a rock solid foundation for a thesis so I would be happy to elaborate on the details of that during your question and answer period.

***Moderator: Dr. Carl A. Spight***

There we have it from the panel. We have opportunity now and I gather we have perhaps of the order on 40 to 50 minutes where we can have exchange with the audience. I will ask that the protocol be that you at minimum indicate your name before question or comment and possible affiliation if you so choose. It will help all of us. You know who we are presumably by now and we would like to know who you are as you bring either comment or question. I am going again to take a liberty and urge that some of that question and comment come from Anthony Johnson and Carlton Truesdale. They where both mentees in the program who now have found a place in the academy and in industry respectively. They can perhaps tell stories also. I certainly urge you to actively participate and so in case you might want to say something Carl or Anthony why don't you be first up.



***Dr. Anthony Johnson, NJIT***

I am Anthony Johnson and I am currently Chair of the Department of Physics at New Jersey Institute of Technology and I was also part of that first group of SRP students that Mirian Gradick spoke about back in 1974. I received the

Bell Labs CRFP Fellowship in 1975. My mentor who couldn't be here was David Austin, he is now Provost at Rice University. I also had a very wonderful experience that summer and like what we have heard I also had an opportunity to do some leading edge research and actually publish that first summer and I was a junior at the Brooklyn Polytechnic Institute at the time. I published my first paper on pico-second electronics back then but it was a very, very good experience for me. First of all I had no interest in Optics when I first came to Bell Labs for that summer and now it is my career, my chosen path. I am also currently Editor in Chief of Optics Letters. So that shows you the impact that one summer had on me as far as my field of choice and so forth. So I had a very wonderful experience. Dave Austin is still a very close friend. I also had the opportunity to meet with him and his family. And he made some interesting visits to New York visiting me and I think some of it was somewhat daunting when he came and venturing, I don't think he ventured that far before but he was quite a trooper. I have known him for many, many years and have really enjoyed that interaction.



***Dr. Carlton Truesdale, Corning***

I am Carlton Truesdale and I am now at Corning Incorporated, I have been there for 15 years. I too was another person that Mirian Gradick talked about on the bus in 1974. My mentor was John Tulley and he was doing Computational Quantum Mechanics and I did actually get a paper

working with him. So I think it is prestigious that we get our first paper before even going to Graduate School. John definitely helped me through some barriers at Berkley. There were issues about who was going to get me equipment and we solved that. Also he helped in terms of preparing me for my oral exams. So I think without having someone at another location being a firm foundation a graduate student could be a fish out of water, not knowing what's going around and what sharks are out there lurking, trying to get you. So this program has really been a benefit to myself and I really support it to continue. It has been important to be and I know it has helped me to get where I am today. I really appreciate the opportunity of coming back.

***Discussion***

Mozelle Thompson, FTC - I do have a couple of questions and I would like to hear what the panel's response would be. First of all, these are clearly success stories and for those who are mentors, and especially those who are white mentors, how do you deal with the issue of the fact that there are some people who might feel threatened about this kind of mentoring relationship? And second, in the work that you have done with your mentees, how do you think you have prepared them in science and technology for what happens after they leave school that might be different than other kinds of mentoring relationships?

James McKenna, AT&T Laboratories - Let me respond to your second question. Not every program can do what you want it to do but certainly coming for a summer to Bell Laboratories or summers as the case was, you had no choice but to learn about what was going to happen after college. Bell Labs was not a college, it was an industrial laboratory focused on creating technology for the furtherance of its business. And I think that is the one key to the success of this particular program.

David Berkley, AT&T Laboratories - I will try the first question which I think is extraordinarily difficult. I was very aware of the fact that in a mentor/mentee relationship the mentee really is looking for partly someone to emulate, a role model. In the case certainly of the early years that we were talking about there weren't many role models out there that were easily identified. Now Charles has tried to emulate me but he hasn't quite gotten rid of all his hair yet! But I do have a serious point because this in fact is a real problem. The aspect of the mentor relationship which has been obvious in some of the points that have been made but I want to bring it out explicitly because it bears on your question is that one of the roles of a mentor is to be an advocate. Not an uncritical advocate - but an advocate. Certainly in my dealings as an outside person coming from a powerful institution inside of AT&T, in my dealings with universities, I found that advocacy could be very important in dealing with some of the issues that you raised in the question. In particular where questions were raised, where there were things going on perhaps in some cases that we didn't fully understand. The fact that there was an outside advocate sitting there clearly standing up for that students who was in a morass of confusion inside the university perhaps was a critical factor in trying to deal with some of the issues that you raised.

In terms of preparing for what happens later I think someone else is going to have to handle that, but in some sense that's just the personal relationship and trying to provide clarity to the students as they move forward.

William Massey, Lucent Technologies -In terms of preparation for what comes later I have had students not only doing research for papers that were published, but I have had some of the students even present their work at conferences. Like when I was going to a conference on Applied Probability and I am organizing a session and then some of

the students who are in the program I would have them present their work. They are surprised that their work is actually appropriate for the conference. I remember having them work in an area of non-stationary queueing for the summer. Only when they got to the conference did they hear a keynote speaker talk about non-stationary queueing being very hard, but they didn't know that working on it for the summer. So I think working at the Labs gives you a chance. I have met lots of graduate students who never get a chance to just stand up and present their work to researchers.

Jennifer Rexford, AT&T Laboratories - I'd like to echo that point also. One great part of the fellowship program is there is financial support for travel (one trip a year) and I took advantage of that every year. My thesis advisor had me give presentations when I wasn't always the first author because there was that funding support for it. He recognized that it would be useful to my career development and my visibility for me to do it. I think that is a part that doesn't get a lot of attention in the program and a thousand dollars here and there makes a huge difference whether or not you get any visibility or experience giving talks.

Albert Greenberg, AT&T Laboratories - I have one point related to the second question. In the course of the work in an industrial lab there is a lot of heated technical debate. Ideas clash. This is a feature that you don't get in the academic setting. I think it was great that Jennifer was exposed to that kind of debate and team work relationship during her summers at the Labs.

Arlie Petters, Princeton University - I would like to say something briefly. I also believe that Bill was a role model to me early on in my career. For example, him having forty papers played an important stance in my

mind in that I felt that was the kind of things I should try to achieve. So after I started my tenure track at Princeton, for example, I have published twenty-four papers and I must say subconsciously the fact that I see the pace that Bill set for me played a crucial role in that way. Now, also I have been talking with Bill all along about strategies of navigating through academic waters and so it is there after in a non-trivial form.

Moderator: Carl Spight - Before taking some additional questions or comments let me just observe as a moderator. Taking a liberty again that there is an aspect of Mozelle Thompson's question that has a certain kind of intellectual and I will say political aggressiveness to it that was not picked up to this moment by the panel. I am just observing, not to say that they are not capable of rising to the challenge of that question. The second point, the one that raised the question of the fact that some of these mentors are majority community white are mentoring to leadership members who are not majority community gender, race, or otherwise, and the meaning of that within the broader "politic". We will call that and politic with quote marks all over it of course. O.K., in any case just taking a liberty as a moderator for Mozelle's very skillfully crafted question.

Patricia Wirth, AT&T Laboratories - I did want to try to put my thoughts about Mozelle Thompson's first question on the table. I think that, what in my observation at least and I would like to hear the panel's opinion about this, is that what is very powerful is the mentors real belief in the student's ability and capability to achieve, not a fake belief that I am helping somebody who needs my help. They must have a real belief that this person is somebody who is capable of being a top-notch scientist and engineer. I fundamentally believe that if the mentor has that view, has that belief, that they can deal with the sorts of things that Commissioner Thompson addressed in terms of communicating that to the students.

Jennifer Rexford, AT&T Laboratories - I would like to add one thing to that also. When I interviewed for the Fellowship Program at Bell Labs, I spent two days meeting in half hour time slots with maybe twenty people. At the end of these meetings I would pick who I wanted to work with. Since mentorship is about intimacy and about connecting with another person, being able to pick who I worked with and figure out who I had chemistry with was the important part. Perhaps a less important factor is gender or race. Having not arbitrarily been assigned a mentor but being able to have that chemistry first.

David Berkley, AT&T Laboratories - Just to follow up with what Pat said. I made a comment in my brief opening remarks about my feelings that Charles was sure to succeed. That was not said lightly. Charles made a little light of it, but it was not said lightly. I saw both the history in terms of originality and the work he had done for his master's program. I also saw his work during the time we worked closely in the summer time enough to realize that there was a creative mind with a tremendous amount of power in this individual. So I was able as an advocate to firmly believe and, think to be correct, that this was somebody who had every right to succeed and that was a major driving force in being able to make that happen.

Marilyn Reznick, AT&T Foundation - I am Marilyn Reznick with the AT&T Foundation. I would like to know if you could speak a little about the selection process or the match-up process. Did you have an opportunity to select your mentor/mentee and what criteria did you look for which relates somewhat to Mozelle's question. How did you choose your mentor/mentee relationships?

Charles Thompson, UMass Lowell - I will tell you how I did. Actually, my first choice was not David, so there was some selection process involved. Actually it was Jim West. Jim West and David Berkley were very close and they tried to put together the best package, knowing that I was going to MIT, that would sell well with the people that I would have to deal with there. Even though Jim is African American and I associated with what he was doing on acoustics, Jim recognized that there were issues that could be better dealt with by David, who was more senior. I thought that was very gracious of Jim West. I remember that. So it was more of a team situation where they both bought into this situation and that we are going to work this system as a team. I thought this was very unusual but they explained it to me as well.

William Massey, Lucent Technologies - Well for me in terms of being with Jim McKenna you come up for the interview process. You spend a whole day talking to various people and with Jim it was I think just the chemistry. I felt like this was the person I wanted to interact with. I have always found this to be true. I think one trait I find in Jim is he is known in some terms as a straight shooter. When you talk to him about things you really feel like you are getting the full story about what is going on.

Now in terms of Arlie, and me that was a little different. The way he was introduced into the Fellowship Program was a little nonstandard. He was an undergraduate doing mathematics and he wanted to do math physics. The first round of the program selection they just saw the physics part and they tried to rank him as a physicist. They decided to dismiss him. When I saw his resume I was just personally horrified that a person like this was not included in the process. I basically reintroduced him into the process. I just set up on my own a set of interviews where I had him talk to various people and in an approach I like to take in that I kind of got

from the Bell Labs ethos doing state-of-the-art research. When interviewing students I try to what I call bring them in the through front door. If there was a visitor at the Labs who was working in Differential Geometry, I made sure that Arlie would talk to that individual and maybe, well Arlie can say because he interviewed other people. It made it a little more likely that we were going to match up afterwards.

ArliePetters, Princeton Univeristy - Well I selected Bill because he was extremely rigorous and I think that is very important for the bottom line.

Laura Rogers, AT&T - I am from the AT&T Network Architecture and Development organization or part of the greater AT&T Labs community. And I also served in Bell Labs for nine years as the psychologist for the health services. I have been an observer and a participant in mentoring for many years and I have seen the best. I am clearly in a room of very committed and dedicated mentors but my question is related to how does the mentor get coached and developed to do their job even better.

Selwyn Joseph, Lucent Technologies - At this time of the year one of the things that is happening is that we send out surveys to the students as well as the mentors asking for feedback on each other and the processes. That is then massaged in committee and part of that process as the incoming class comes in we will have workshops for the mentors and Dr. Adams who you will hear from later has been our moderator and facilitator and mentor to the mentors on many of those occasions. It is a process which I think works and one that I hope is continued in both companies as the program continues to be developed and takes hold.

Going back to the mentor/mentee relationship over my nine years or so managing the program, I think there are

two things that have stood out in feedback from students. These are that the mentoring relationship is one of the things that they value very, very highly in terms of their track through graduate school. That coupled with the fact that we do support them to attend conferences either as presenters or just participants with or without their mentors also works a great deal in terms of their development in getting over the hurdles in graduate school.

Lee Lorch, York University - I am Lee Lorch of York University in Toronto, Canada. I am the one foreigner on the list here. The question of how the relationship has affected by mentors being white or I might also add being white and male, whereas a mentee is going to be black or Hispanic or female or some combination thereof. Dr. Wirth I think gave a very essential point in establishing the necessary confidence. The mentor has to feel in his or her very gut that this is something not being done as a duty but something you really feel, that you understand the human worth, the human talent and the human quality of the person and persons with whom you're dealing. There is really a double whammy involved. It is not only the difference that the first question raised but also the difference in status a student coming to somebody who is already established in the business has also that obstacle to overcome. The good faith question to which Dr. Wirth pointed is very close to my heart. Quite frankly I came to this issue not because of primary concern for the work force but for social justice. I think that if a person who wishes to be a mentor is in some way identified with the aspersions and lives of the people to be mentored that that is what can bridge the gap.

In my time teaching in historically black institutions in the Southern United States it was whether you were there in the struggle against segregation. The student knew that you were concerned with the whole life of the student, whether the student came to your home regularly, whether the student

and mentor knew one another as human beings, and as human beings with mutual concerns. This seems to me to be rather essential in bridging this gap. Now time must pass and I suppose you are increasingly conscious of it as I speak but there are still issues, if it isn't the lunch counter today it is the assault on affirmative action which has reduced the minority enrollment at University of California, Berkley by some 61% in one fell swoop. A mentor, to establish a relationship, a deep tie with a student, should be outspoken on those issues to preserve the opportunities which are being challenged. Mentors are being increasingly challenged to have the courage to do so. This, of course, is only one aspect of mentoring, but I think it is a very necessary one if the mentee is to feel in his or her gut that the mentor is really there for him or her and will always be there to help in securing a career and in protecting that person in the career. Young minority members, young women, when they get our academic jobs don't start with tenure and those years are rather nerve racking years for a great many of them. The mentor has to be there in that period too and be there vigorously. These personal ties, this identification with the lives of the people, and with the issues, the serious social issues that impact on those lives seems to me to be necessary for mentoring.

Louise Brown, AT&T Labs- I am Louise Brown, a recent graduate of the ALFP and I just started working at AT&T Labs. Most of you may have noticed I am a woman of African decent and my mentor is a Caucasian male. Our relationship was excellent, is excellent and is continuing, but I wondered if, the panel I don't think can address this because there are no doublets like that up there, but I wondered if Dr. Gradick's mentor could tell us if he had any difficulties? That is the kind of relationship I am looking for. I just wanted to know how you approached this mentoring problem, as it were, if there were any problems.

Peter Bricker, AT&T - I think if we pursue the history behind Mirian with the name of Jim West it will add a little something and at the same time answer your question, but with what degree of generality I don't know. Marian did mention that I did use a lot of red pencil, I'm going to have to correct her again on two counts. First of all, she did not walk into the wrong door, it was obviously the right door. One of the reasons it was the right door is that Jim West was in that room. As she mentioned, it was that initial encounter, enthusiasm, and lots of other positive values (I wasn't there of course) flowed from Jim and gave her confidence, inspiration, courage, interest and so on, right away. That sort of illustrates the point that it is the beginnings of things on all kinds of time scales that are very important. So right there, this is the other point, that I was not her first mentor. In a way, in miniature time, Jim West was her first mentor. His being an African American male, in part, she didn't have that conflict at what was her very first moment. Then I would like to go back beyond that, about 40 years ago, a little accident in history. This was before we had any summer programs at Bell Labs. Jim West was in an automobile accident and was suffering from whiplash, he couldn't drive for awhile. He lived in Madison and so did I. He was not a member of technical staff at the time, he was somebody's lab assistant, and he sort of asked me if he could have a ride to work. Sure, I said, and so for about a month I picked him up and we rode back and forth to work. Very simply, we got to know each other, he confided in me. I got to know him as a person, and that relationship I think gave him the confidence to recommend the hook-up between Mirian and me. Mirian was very risky, in a field called psychology, we weren't sure if was that a science or anything at the time, but I already had a job there and so it looked like a good match-up.

Then when I retired, now leaping forward in time, there was a moment at my retirement party when Jim West gave me

very great compliments. He said at that time he was recovering from his accident he didn't feel very welcomed at Bell Labs, but I merely, from spending the time with him or something, gave him the courage to hang in a little longer and look what happened. It takes time, one individual, one relationship at a time to make it work.

Howard Adams, National Center for Mentoring -This would be a good time to just turn this around and say it the other way. We act like this is a one way street going white to black and it's not. Those of us who are black and had the opportunity to be in a situation where we have had to mentor whites and we just mentored. Mentoring is mentoring. I have had the good fortune to mentor black students, Native American students, Hispanic students, women, white students, white faculty, what does that mean? I think what I hear us saying here is first of all you have to be concerned about people. You have to be willing to see people grow. If you are not willing to see people grow, this is the wrong business that you are in. So, number one, you have to like people.

I work with a lot of school teachers and do a lot of talking. In fact I am going to talk tomorrow at Clark Atlanta University to a group of educators and the first thing I am going to say is that if you don't like kids get out of this business. You don't need to be in the business of education because kids do crazy things. You have to like kids. So if you are going to be a good mentor, you have to like people. That doesn't mean don't be tough, and mean and all that kind of stuff, yes, but you still have to like people.

And so I sort of got the feeling here that we always ask that question about what happens when a white male has to mentor somebody who is different. We have been doing it all the time. It works both ways. I have lots of colleagues here who I know are thinking the same thing I am, why are we discussing this as if it were one way, its not one way. I am not saying that is not a good question to ask.

Louise Brown, AT&T Labs - My question is really directed toward men mentoring women.

Howard Adams, National Center for Mentoring - Right. Men mentoring women. It's the same kind of thing. It could be asked the other way. Women end up doing what, mentoring men, and we don't look at that as a different kind of thing. I am looking at my colleague here who have had the same kind of experience that they have been in the business of mentoring men and they have done it over a long period of time.

Let me say just one other thing that I thought. I wanted to just put in the Bell Labs piece that I think we need to make sure we put up here. That is a key thing these mentors have done, you started this undergraduate who were not sure they wanted to go to graduate school. I have been in the business of graduate education and what you do is that you validate these people have the capacity to go on to graduate school. That is a major piece because a lot of times we hear that your brains have to be running out of the back of your head, that everybody who ever went was a genius, they knew all along what they were going to do. I run into these students, they don't know what they are going to do, they are not sure, they don't have a dissertation topic already. And you all of a sudden sort of calm the waters and say "wait a minute, I didn't know what I was doing either". I mean, I am mentoring all these students and the first thing I tell them is I'm still trying to figure out what I am going to do with the rest of my life. So you don't have to have all the answers.

One of the great things that the Bell Labs program has done is that it took a group of students, early, validated that you could do this stuff, hooked you up with other people, got rid of a few of the cobwebs, but told you that graduate education was very important. If there is one thing I speak highly of for Bell Labs, it is that you have been one organization that

consistently around the country has made a case for graduate education. That is awesome and that I think is critical to what we are doing today and mentors have been major in that piece and I just wanted to make sure that we somewhat got that up on the table because that is what it starts from. If you don't do that, the rest of it isn't going to work.

Charles Thompson, UMass Lowell - In the graduate education process, you know, we still don't have a lot of minority faculty members, women faculty members nor do we have Native American faculty members. You know that getting a Ph.D. is an anointing process. I guess when David was my mentor back in the 70's, minority students, African American students weren't validated. Mentoring wasn't as fashionable back in those days as it is today. Diversity wasn't embraced as it is now. It probably still isn't embraced but we have to do lip-service to it even if we don't embrace it. The idea, and Carl well recognizes this, was explained to me the very first day I walked into the Labs. The process involves the senior member of staff using his reputation or her reputation to elevate the student to the visible end of the spectrum. Unfortunately today, to raise the visibility of scientists to the visual part of the spectrum means that first they are going to have to question the mentor's technical capability. I think that this is a real thing and it is going to continue. The fact that a woman has a male mentor, it is really more of a function of the fact that a male is in the position to elevate the women. If there were more women in that position maybe that could happen, but that is a crucial ingredient. I think Carl Spight and Bell Labs understood that early on. That this is a real clubby atmosphere, we have to have the right members of the club saying the right thing about their students.

Bill Velez-University of Arizona - I am Bill Velez, Professor of Mathematics at the

University of Arizona. I was thinking about Mozelle's question about how AT&T prepares you for the future. I am not an AT&T Fellow but in 1973 I was taking a course in Algebraic Coding Theory and my thesis advisor had worked with Jessy MacWilliams. He called her up and said he had a student. I remember that they didn't have a program for advanced graduate students but they found the money somehow and I spent the summer of '74 at Bell Labs. That's the first positive thing. I had never had a summer experience before and the fact that they were willing to put up all of this money increased the self-confidence that I had.

When I arrived here I met Berly Camp, Gil Bert, Jessy MacWilliams, Neil Sloan, Persideous Coneus, I played ping-pong with Paul Ardos, I worked with Ron Graham. It recalibrated my intellectual mark. I wrote the first paper here on a problem that Ron Graham gave to me. He mentioned many problems to me but one in particular stuck in my mind and I saw him a week after that and he said how's it going and I said I will have the solution for you at the end of the week. Well I wrote my first paper on it, but the problem was solved by Carl Palmrams about two years ago. Nevertheless I was able to play with the big boys. Ron Graham, I never thought of Ron as being a mentor, simply as a friend who had wonderful problems to work on, he later became President of the A.M.S. and put me on committees. Networking, that increased the number of people that I knew.

I went back to the University of Arizona, got my Ph.D., and I decided not to go into academia. I went to Sandia Labs. It was because of the experience that I had had here that it changed the direction of my life. I went back to academia but over the years I have been a consultant to the Navy and again it was because I had this experience here. I think this experience gave me the self-confidence to say "yes, mathematics is interesting, it's inherently beautiful, but it is also applicable and it solves problems".

Samual Myers - The young lady who was here, Andrea Nichols, and I work with a small group of people in Washington to get the best and brightest from historically black colleges to go into internship programs. The essence of my question is that I have heard, and been greatly inspired by the discussions today, but what would you advise as to the politics of getting these best and brightest students into these internship programs? I was struck by a parenthetical statement President Bulger made today when he talked about his Law Degree and that he didn't know anything about engineering and he couldn't be the President of the Academy of Engineers unless politics was involved. Today we have heard a number of comments that accidentally one had a whiplash, he became a very close friend of a person who in turn recommended this person to the young lady who rose up into the ranks and succeeded. So the answer to my question is what would you advise about the politics of getting these best and brightest students into these internships?

Albert Greenberg, AT&T Laboratories - I think I will echo what Bill said. I guess he noticed on Arlie's resume his work on Clifford Algebras. Something that really showed outside of the normal just being excellent, he has an inherent curiosity that's apparent. So I think that is the kind of thing we value a lot and will lead to the connection to get into these kinds of programs, this extra interest.

David Berkley, AT&T Laboratories - There was a comment made earlier about networking. One of the things I know we were very conscience of in the early days of the programs was the fact that we were in a situation where the networks did not exist. This mentoring relationship we were creating was an artificial one where there was very natural mentoring. In some areas this was something we were creating out of whole cloth, not exactly knowing what we

were doing. Hopefully, and one of the things I think this 25th anniversary is about, is that we have learned over the years some of the things that we were fumbling for in those early days have become codified. They have become things we can understand, can be put into a book, and be turned into real knowledge for other people to draw on. But I think the creation of those networks is a critical part of the politics and there have been individuals, it almost looks accidental, but I think Peter Bricker told a story about Jim West. I could tell almost the same story about Jim West and Charles has already mentioned it. There are individuals who go out there and create their own politic. They go out there and Jim who I know, was somebody who would go to every school he could get his hands on. He was creating the networks, bringing the people together, and actively trying to create a, call it an artificial, body politic which eventually becomes the engine to make the best and brightest get into the proper positions.

William Massey, Lucent Technologies - When it comes to talking about politics I guess it depends on which direction you are looking at. I think one thing on the company end, well this is something I think will now happen since there is now a parallel program at AT&T and Lucent Technologies that the company should do a better job of advertising these programs. I remember my personal experience twenty years ago, but I remember I kind of got into a program by accident. I just happened to see a brochure pinned on a bulletin board. I think we need to do things now a little bit more systematically and just make sure as wide range of people as possible know about the program.

On the student's end, one feature I try to look for is do they really get excited about what they are doing, having the skills there, that is nice to, but there has to be an tendency from the student that I really want to do this. That will usually get you through rough spots. I think research in some sense, in general, is fundamentally networking.

You are always reading journal articles, you're reading books, you're going to conferences, and you're talking to people. Its every aspect of it, I mean if you really want to make it in graduate school you need a willingness to use every single possible resource that is available to you. You're always trying to get more information. You try to go from every possible direction. I remember the summers, I spent about three summers doing graduate school working in Jim's department. I remember the summer in the middle of doing my thesis. Part of the idea for my thesis I got from my professor, Joe Keller at Stanford, working at Bell Labs and being interested in queuing theory and I was working on slightly different research from what the people in the department were doing. Bell Labs was the center of activity for Performance Modeling and Queuing Theory. Every time I'd talk to somebody they just say, "Oh, did you ever think of looking at this?", and they pointed me to a paper. I found these new ideas, I tried to see which ones I could use and incorporate into my thesis. It just snowballs. When I say getting ideas from people they don't have to be quote "the names". Just passing off ideas off of another student can be helpful. That is also a way of meeting people because I think sometimes in networking people see it as "identify those key people and latch on to them." You are never going to know who are going to be the big people. The big people now may be not be later, people who aren't now maybe later. It is just a better strategy to just to say to yourself, "O.K., why don't I just talk to everybody and that way you cover all your bases".

Jennifer Rexford, AT&T Laboratories - I think another factor in finding good students is being able to find good undergraduates which always seems very difficult. One thing that I found that the National Science Foundation had grant support to hire undergraduates to get involved in graduate research. In my last year in graduate school I applied for funding from N.S.F. to bring

two undergraduates in to work with me and it served a great purpose. Those two undergraduates went to graduate school. They each had publications before they went to graduate school. And I actually got some experience mentoring before I graduated. The more we can do to encourage that kind of funding so we can develop personal relationships with students before they get into the graduate program, and it will help them get into the graduate program, I think that would be a great thing.

James McKenna, AT&T Laboratories - AT&T and all of us who have been involved in this program are justifiably proud of it. But that is not going to get the whole country to where it wants to go. The problem is a great big one and clearly there are hundreds and hundreds of people who never come within the sight of AT&T or companies like us. This is a huge corporation, its way up at the top. In reality, there are hundreds of thousands of young people who are never going to come in contact with an organization like AT&T. I think the solution will only come if many, many more companies at much lower levels and smaller levels decide that something like this program is good for them. So I think we should consider other ways of justifying programs like this other than the ones we have been talking about today.

Let me just give you some examples. I retired from AT&T before I finished my career and worked for Bellcore which was another piece of the AT&T split off. Bellcore was a company that was going through quite difficult times for about the last five years. Things now seem to be happily turning the corner, but in an atmosphere where things aren't calm and serene, at least on the surface as they seem to be in the 70's at AT&T Bell Laboratories, its a very different world than you are living in. But the point is, that in a situation like that mentoring can play a great big role, not necessarily to scientists, but to all sorts of people. I think if we painted the picture of mentoring in a bigger

and broader context, we might make it more secure than what it is.

I said I was thinking multipliers. Working for AT&T Bell Laboratories in the 1970's was like being an upper class Britain say in 1890, you know the world never set on a British rouge and somehow or another it was never going to set on AT&T there either. Well we've all come to the conclusion that maybe that is not exactly right. So I think we should think in different terms like that. Don't get me wrong, I love this program, as I said this is one of the proudest things in my life, but I think we ought to try and set it into a bigger context and try to sell it to other people in this broader context. I think we will have better luck doing it.

Moderator: Dr. Carl A. Spight - We are moving into a zone where we are going to have to be quite frugal in how we use the time remaining. I know there is a question here and there is one here. I want to just observe to that last question about choosing the best and the brightest historically black colleges and the politics of that kind of situated process. There was a ten-year period from 1975 to 1985 where I was certainly very active in identifying the best and the brightest at Historically Black Colleges and Universities. Your choice of politics is enormously profound here and I am hoping that maybe the afternoon panel will dare unpack the implications of some of that as it talks about university perspectives.

Jean Jervais, Committee for Institutional Cooperatives - I just want to comment on the male/female issue. I do think it is a very significant issue. I wouldn't ask my question but I will make the comment. I have worked with matching students with faculty mentors for the last twelve years and not an uncommon question or concern from male faculty members is do I really want to work with this female student? What about sexual harassment? What am I going to get myself into? What problems might I get myself into

in the future? And so some of them will intentionally go with a male student just out of that concern or at least that is the excuse that they give. I also know that in my own case, my own mentor said to me at one point, "you know, if you were a male I would have invited you up to my room and we would of had a drink and we would of talked about all these kinds of things informally." When I go to conferences with my other colleagues that is what we do but since you are a women I can't do that". So those informal discussions don't take place. I think, somehow or another, we need to address that problem and how people overcome it and deal with it.

## University Perspective

*Moderator:*

Professor Wesley Harris, Professor, MIT

*Speakers:*

Professor William Velez, University of Arizona

Dr. Howard G. Adams, National Institute for Mentoring

Dr. Sheila Humphreys, UC -Berkley

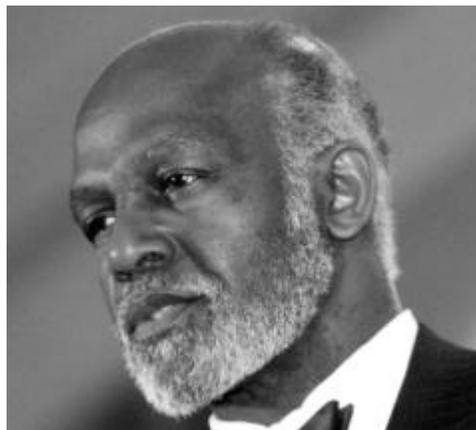
*Coordinator:*

Dr. David Johnson, AT&T Labs

### ***Dr. David Johnson, AT&T Labs***

This morning we heard about how AT&T's program works and about its success. This afternoon we want to look a little more broadly at both other programs that currently exist and what might happen in the future.

Our first panel will give a University perspective on mentoring. This panel was set up with two purposes in mind. One purpose is to address some questions that many of you may have had in the back of your head; How does a program like AT&T with external mentors interact with universities where the students are? Is this a welcomed interaction? How can this interaction be made a positive one? Second is to give us their perspective what universities are doing in the area of mentoring. Professor Wesley Harris of MIT, a Professor of Aeronautics and Astronautics will chair this panel and he will introduce the rest of the panel members.



### ***Moderator: Dr. Wesley Harris, MIT***

Thank you David and good afternoon. I would like to just take advantage of being the first speaker this session and I will offer some of my own biases and comments.

First of all I would like to talk about Alice Miner. Alice Miner is not an AT&T Fellow but she is my grandmother. One of her contributions is a recipe for applesauce cake. It is a recipe that hasn't changed. It has been very, very satisfying throughout my life. The recipe wouldn't change. Her market is a very constrained one. So there is not a need to change the recipe.

Of this particular organization, this particular fellowship situation, this particular structure for mentoring, I do ask for change in the following sense. My experience at many other universities, associations and institutions suggests to me that there is a wave of change in higher education in all the sciences as well as in education in other areas of scholarly pursuit. With these changes we can identify certain trends. For each of those trends we can identify a set of ramifications and from each of those ramifications we can draw a set of requirements in order to be successful.

My challenge to this AT&T operation is to do the same. It is my belief that if you are to remain competitive in such a dynamic environment you must change. From what I heard this morning I was quite impressed

with what has been obtained and done in a very scholarly and profound way. However, I did not get a sense that this organization was aware that much is changing. Maybe one ought to understand that in order to guarantee continued success. So the recipe works for the applesauce cake. I am not sure it's going to work forever for this program.

Earlier Mr. Wulf talked about engineering and his idea of what it is - this thing called design. When I am asked to explain what engineering is, I start off with an analogy with poetry. For me, and I think for many, poetry is never, never done when it is written. It must in be read to an audience, that is one of the beauties of it. The words themselves on paper just do not bring out its completeness and beauty. It has to be read to an audience. That's the product.

For an engineer what we do has to show up in three dimensions otherwise, as far as I am concerned, it is not engineering. You have to be able to kick it, smell it, touch it, feel it, roll it, or do something with it. It is a product that hopefully is produced in a way that it is sustainable with the environment and that it solves problems rather than creates problems. But there in lies the beauty and strength of engineering. It actually appears in a useful, sustainable way and in the three-dimensions that we can identify. So I would also like to add that to the comments that Dr. Wulf made.

Now Charles Thompson, my colleague in a foreign country (Massachusetts), I'm sure is the reason I am here. I do thank you for that Charles. I am also honored and pleased to be with some old friends and colleagues. Carl Spight and I go back to the days of dirt and that's a fairly long time and it is good to see him again.

I have the honor of introducing three people who have a different perspective on mentoring in terms of how mentoring is handled within a university. We have a professor of mathematics, we have a person who has taken a national view for many years, and we have another colleague who

has toiled long and successfully in various support-positions within a major university. We have in the program a short biography on each of the three speakers. I therefore will not go into that. I will simply introduce them in the order listed in the program.

The first is a jack of all trades. On his card he just gave me reads: Bill Velez, Professor of Mathematics at the University of Arizona. Bill.



***Prof. William Velez, University of Arizona***

The comments that I would like to make today are those of a person who is out there in the field. I would like to think of myself as just one of the grunts out there teaching and trying to encourage students to study more mathematics. I spend a good deal of my time going into the pre-college classroom and talking to kids. Today I was thinking about the words that Michael Armstrong said. He said, "Do these students have potential". The story that he gave was that of someone who was looking for people that are different.

When I go into the high school classrooms and I see these young Chicano kids. These young Native American kids, they look different from the professor. You don't see these kids among our faculty and I often wonder when you see differences do you actually see the possibility of potential.

A number of years ago I had a party at my house and one of the graduate students had a little too much to drink. This graduate student I had helped, he wasn't one of my Ph.D. students, but I did help him on his problems. We co-authored a couple of papers. He got a little bit too much to drink and he told me that "the only reason they had hired me at the University of Arizona was because I was a minority." I was different and he wondered if I had the potential. I think that this is a common view amongst faculty at the universities, among those who teach our children.

This picture of myself I find to be very important because I was 19 years old it was taken. That is when I decided I was going to get a Ph.D. in Mathematics. When I go into the high schools, I show them this picture of what I looked like when I made that decision that I was going to go on to get a Ph.D. in Mathematics. When someone like me goes into a high school classroom and tells them that he spends his time thinking about mathematics, well they say, "Hell your so damn old what else would you be doing."

But this is not the way I started out. I have this passion that I want to convince kids to study more mathematics. So I would like to talk a little about the success I have had with these kids.

Here is some data on our graduates. I started working with these kids in the mid 80's. You see the Hispanic students we were graduating are few. In '94-95 the Hispanic students and one African American student comprised 20 percent of the graduating seniors with bachelor degrees in mathematics, not math education. Typically, I have around thirty minority advisees each semester. Now, as I travel around the country, it turns out I have more Chicano math major advisees than many departments have math majors. We graduate more Chicano math majors than many departments graduate math majors period. So in fact, we can convince our children that mathematics is useful.

Now at sometime in the semester I get listings of students, call them up and set up

appointments. My teaching schedule is usually Monday, Wednesday & Friday, so Tuesday and Thursday I go into my advising phase. I start at 9:00 in the morning and end at 4:00. I tell you that at the end of the day I am beat. I do this for three or four weeks straight. I have twenty minutes to have an impact on a kid; that's not very much time. And so I have a form that I go over with the kids - Some things to do to succeed this semester. (Form shown on an overhead projector) I want to focus on the last item. Let me move it up so you can see it. I tell them, if at some point you find that the major you have chosen to study is not really exciting to you, come back and see me. I would love to talk to you about maybe choosing mathematics.

Now I do something that is absolutely terrifying. When students come in, these are students who are taking first or second or third semester calculus, if they have not declared a major, I take out my math major form and I make them math majors on the spot. Now this is terrifying. There are times when I never see that student again. Even though I call up that student and set up an appointment, they refuse to even come into my office. Now I don't care if that student has started with intermediate algebra, or taken college algebra or trigonometry and is now in calculus. If they are taking calculus, to me they are amazing. I don't care if they are getting C or D in their courses; I want them to take more mathematics.

Now it turns out that in fact that these little advising sessions turn out to encourage students to think about mathematics. So here is a message I had last semester from a student who had done terrible things to himself. He was behind, he needed to get ahead, he had gotten C's and D's in his technical courses, but he was behind so he was taking several technical courses, chemistry, calculus, and physics. You know he was going to be a failure. So I talked him into dropping a course for which he didn't have a prerequisite. I think the last comment was interesting, he said, "OK, I would like to meet with you again in order to see if I

would be interested in majoring in math or some other field". Oh, this is wonderful.

So I see many of these students and so what is it we as researchers can do to increase the number of students who choose to continue studies in our field. I think that the student should be able to ascertain from the conversations he has with the faculty: What is it about the subject matter that makes it interesting? What would one do with a more thorough knowledge of that subject matter? What are the prospects for a job? Suppose a student would choose that subject, what would happen to him or her during their undergraduate years?

Now I received this Presidential Award for Mentoring, so my Department Head thought that would be a good excuse for me to give a presentation to our own faculty about how to do effective mentoring. So we set up a colloquium and three of my friends showed up. But actually one of my friends told me something interesting. I put up this overhead and you know, this long-standing faculty member said he wouldn't know how to answer those questions. He couldn't do this mentoring because he wouldn't be able to provide that information. I was really amazed.

So, let me leave you with some thoughts. I feel very fortunate being a University Professor. I have been given this opportunity by this country's taxpayers to become involved in the creation of new knowledge. I have personally profited from this creation process by the very act of creating this knowledge. This activity has given me the confidence to approach problems and to know that I have the ability to successfully come to grips with the problem and to find ways of solving the problem. If we can only transfer this confidence to our students we would develop an effective work force. The professor is not a machine for the creation of knowledge. It must become our responsibility to use this knowledge and knowledge creation to improve the lives of our children. Taxpayers support basic research not because basic knowledge is

inherently good, but they support it with the hope that their own children will be able to participate in this activity. We don't have to look to foreign lands for future engineers and scientists for this country. These future scientists are here, across the street from us, living down the block, attending our neighborhood schools. We are losing our children to a culture of violence and drugs. And it is up to us, us, who are creating this knowledge to attract these children to our life style.

Now I understand perfectly well that there is a chasm between the professor and the student and we have a hard time trying to bridge that gap. I think it is also a part of our culture that we would prefer to leave these social problems to others. So if we are to effect change, then my suggestion is let's do it one student at a time. We are not here to change the world, just a piece of it. Look at the students in your classroom and I think that the best advice that I can give you is the advice that my aunt used to give me, and my mother used to give me when I was a child. When someone came into our home my mother would say, "Saluda mi hijito" say hello my son and it was a common courtesy that if someone came into our home you had to get up, you had to shake their hand, you had to make some kind of conversation. If you were creative you would get out of there, real quickly but you had to have that common courtesy. That's what I think we need to do, we need to talk to our children. Thank You.

***Moderator: Dr. Wesley Harris, MIT***

Before Howard takes the podium let me share some of my experience about mentoring. Some dated experiences but very, very singular ones. From 1972 to 1985 I was able to produce about 30 Ph.D. and Masters students at MIT working directly with me in the Department of Aeronautics and Astronautics. Many of whom some of you know were minority men and women and including some Caucasian women as well. As I have gotten older I have tried to reflect on that and tried to

understand what is important. What really happened in the Department of Aeronautics and Astronautics within the school of engineering at MIT from '72 to '85?

I would like to start this series of comments by reflecting on something that a football coach said in the mid 60's. He was a coach for the Green Bay Packers; Lombardi was his last name. He said something like this to his players, "fatigue will make cowards of you all." You just could not take the field if you were not in full condition. Fatigue will make cowards of you all, of all of you." Now for a black faculty member at MIT in the 60's, 70's and 80's in the Department of Aeronautics and Astronautics fatigue was not allowed. What does that mean? In terms of being a good mentor that meant the following, that you had to be able at that time either to open up a totally new field, technically, or to close one out. That was the only way you could not become fatigued in that department, you either had to open up a totally new field, or to close one. You had to be a scholar of international reputation.

Second, you had to normalize for racism. I looked around at my 30 colleagues, they all had teams of students that looked and smelled basically like they did, that is how the department was structured. Not that all of MIT was that way, but it was clear for me that I had to normalize for racism in building my research teams at MIT, in the Department of Aeronautics and Astronautics, School College of Engineering '72 to '85.

So, as we developed it was clear that I could throw any tomato any rotten egg at any one of my students, and I did that in order to make them good. Because they knew that was the objective, they knew that we were together and had normalized for racism. It was a conscience effect, a conscience effect that I made to assemble students who agreed that the only agenda was technology, that race was not one. Now they had to come in and be tattooed in order to get in and understand that that's the ticket to passage, that race was not an issue. It

had to be so strong, and so direct, that not one person, once they signed on, was going to get out of it, and it worked. The group looked no different from the other groups of 30 odd faculty members at MIT in that department. They all had, each of those groups, they all had something in common and the thing in common with my group was that we had to normalize for racism. We in fact did that.

So, I don't know how AT&T Labs wants to look at this experience of 25 years, what's really important, how you pull out the broad strokes, but I would appreciate it if AT&T Labs were to do that because I'm not so sure I have heard what is important. I've heard that everyone feels good about each other, but I don't know what you folks have experienced and are willing to share with the rest of the community even if it is dated.

Now Howard is also from Virginia like I am so you are going to get a good presentation for sure. Howard.



***Dr. Howard G. Adams, National Institute for Mentoring***

We have something in common here when you are Virginians. Anybody who has heard me speak knows that we even put another word to it, if you're a Virginian and you're a male you're a Virginian by everything. When Wes and I were coming along they didn't expect us to be included in that group. Wes is a little bit, just a little bit, more fortunate than I in that he had a chance to go the University of Virginia. When I finished high school I missed it by a

year, it was still segregated by law. I couldn't go. I missed it by two years, yes two years. But the other thing you should know about us from Virginia if you're male and you're from Virginia, if you own land you are a Virginian gentleman. So Wes was a Virginian gentleman because he owned land in Virginia and he maintained that. So we sort of, all of us, we have a joke about that, those of us that came from that era at that time.

I want to talk to you about mentoring from a little bit of a different perspective. Let me just set the stage for this for myself. I have spent twenty years of my life working on how do you increase the representation of underrepresented minorities at the graduate level in science and engineering. That's all I've done. It's been my life. I eat and sleep it everyday. That is all I dream about. Let me tell you a little about what my approach was.

When I got into this job I had two problems that people threw at me right away. Number one, you can't find people who want to go to graduate school. I did not believe that because I wanted to go. So I didn't understand why other folks like me didn't want to go, so I didn't let that bother me at all. Secondly, we were going to be working with the MIT's, the Georgia Tech's, the University of Michigan's and the Cal Tech's and the Berkeley's and all of those schools. The folks would say even if you find them, they will not go to those schools and if they go they wouldn't finish. That was our charge.

Well, I was very aware that you couldn't send anybody to school that you could not find. So the first thing that you have to do is to identify people who want to go to school. And once you find them you have to convince them that in spite of themselves that's what they want to do. They want to go to school. I would walk into a room and see some of the students in there that heard me speak and laugh. I would walk into a room and tell the students to close your eyes, say your name, and put Ph.D. behind it. Just see how that sounds. It was amazing how I

would see people open their eyes and start smiling, they never thought about it before. I'd always pick someone who had a unique name. Peace Champion. Peace Champion, you got to put Ph.D. behind it. You can't be walking around with a name Peace Champion without a Ph.D. behind it. That's a name that fits with a Ph.D. So we would go back around on that, and we would talk and I would say, now I know what you're thinking, I don't have time to do this. I would say you have forty years to work, and they would go - "Oh my god, I don't plan on working forty years, I'm not going to work forty years." You have forty years to work, and the reason I know that is because I kept checking the retirement line on my paycheck. It told me that if I was very successful what my retirement date was going to be and I was going to have to work longer than forty years because I started real early, Wes.

So Dr. Jennifer Rexford, that you all sponsored, told me that the only reason she went on to graduate school was because I told her she had forty years to work. She said if I've got forty years I might as well go to graduate school and so students decided to come. Then I said to them, "OK, we have money, and not only do we have money", there are other folks who have money, and I would point that out and we would talk about how you would go about finding this money. And how do you even sneak up on money. It's not just laying out, you have to sneak up on this money. So we would get students prepared to sneak up on money. We would tell them how to go ask for money, or tell them who had the money. And I would say to them, if they tell you they don't have none, which they are going to say, you tell them, I just talked to Dr. Adams yesterday and he told me you had money in your back pocket. He told me that if you didn't give him any, I could call him collect. Students knew that, that I could call him back and tell him that you didn't give me any money. Oh by that time everybody knew they would call so people started

doing what they were supposed to do and students got money.

Then I'd say to the students, now with money in hand, and a desire to go to graduate school, you go ahead and apply and you work very hard, and if you don't graduate I am going to kill you. And do you know that these students that people told me that would not go to MIT, went to MIT and they graduated. It scared everybody half to death. They went to the University of Arizona. We had gone through 14 students who had gone to the University of Arizona in Engineering and had graduated 100%. Not a single one failed to graduate. Johnson came to me and said, "what are you doing, what is it that these students are doing". I said - first I told them I would kill them if they didn't graduate. That was the first thing that we did. And they knew what we were talking about.

So I want to run through then a few of the issues that are engrained in this piece. I want to say to you that; don't say it can't be done, we have been working with the GEM program for 20 years now and we just graduated our 20th class. We have had 88% completion rate at the Master's level, and of all the people who go to graduate school in engineering only 81% graduate. We are 7% above the national average. At our prime, at some of the prime schools, those schools that people said they wouldn't go to we have done better than that. At Stanford we have graduated over 94% completion rate. Georgia Tech we have almost 300 graduates at the Master's level about 93%. At the great MIT, we graduated about 89 students at a graduation rate of about 95%. At Berkeley we are 93%. We have done extremely well in places that people did not think it would happen. For a long time, small numbers but we didn't have anyone go to Cal Tech that didn't finish. Many of them would not have had a chance to go if we hadn't come along.

Last year of the students we had been working with 8 came up on tenure and we tenured 8 out of 8. All of them. Let me tell you where they are. Theda Daniels-Race, let

me call them by name so you don't think I'm just whistling names, you can call them up, they are real, live, kicking, screaming folks. Theda Daniels-Race is at Duke University, she is an Associate Professor. Ava Demard is an American Indian, she is at University of Michigan and she is an Associate Professor. Dr. Gilmore is at University of Michigan, he is an Associate Professor. Bo Champ is at the University of Puerto Rico, he is an Associate Professor. Christine Grant is in Chemical Engineering at the Northboro State University, Assistant Professor. Andrew Mead is an Assistant Professor at Rice University. These are real kicking, screaming people.

If you picked up Black Allegiance magazine in November a young lady named Leslie Burns. She is a Vice President. At Xerox she is one of the top 40 people at Xerox, she is less than 40 years of age. She is vice-president of one of the A-Technical Businesses.

One of the real success stories that I tell people is that of a young lady named Lisa Crumpton Young. I met her when she was a sophomore, she was really just an excellent student, but she had already told people "I'm not going to graduate school".

I was going to come to Texas A&M and so they said OK, we will give you to Howard Adams because he'll take care of that. So they gave her to me to show me around the campus. When I got into the car she told me they had already told me you're going to word me to death. So let me tell you before you even open your mouth, I'm not going to graduate school. And I told her, if you had not been nasty I'd let you go get a Master's, but since you were nasty, I'm going to make you go and get a Ph.D. And you are going to go. You have no choice in this. Well, my young lady named Dr. Lisa Crumpton Young, she is at Mississippi State. She is 30 years of age, she got her Ph.D. at 26. She was voted the outstanding faculty member at Mississippi State at 29, she is a NSF young Investigator. She has about a million dollars in research, she has a lab, a whole floor, she travels all over the

place doing all kinds of exciting stuff. We were talking about all these things we say to students and she was mine and John White asked her, “well what does he tell you all to do about having children”? She said “he tells us not to have any until we get tenure”. She just had her first kid about three months ago so she is a fresh mother at this time with tenure at Mississippi State.

Mentoring is nothing without chemistry. Mentoring is chemistry, chemistry between people. It's people getting into the lives of other folks. It's telling them good things when they need to hear about good things. It's being there when they need a prop up. It's being there to kick them in the pants when they need it. It's being there to guide and direct. She would not have even gone to Mississippi for an interview, she told me that, “I'm not going there for an interview even” and I said to her, have you ever been to Mississippi? She said No. I said has anybody done anything to you in Mississippi? She said no. You can't go around talking about Mississippi if you have never been there. You have to go. And because you are so good, not only do you have to go, you must get a job because I know you are that good. So I expect you to have the interview of your lifetime. She went down, had the interview of her lifetime, got a tremendous offer, came back and she said, “Doc, this is the place for me”. She would not have even gone without us being in her life. So it's the chemistry.

When you start talking about going to graduate school though, not just for minority students, for all people, there are a couple of things you need to know. One, just the fear of the unknown. All of us fear. And we want to bring this on to minority students. All of us fear the unknown. White males do. If there is a scared group of people I would run into, it is they, but they have had all the support. All my friends tell me when they go into an all black situation it scares them half to death. A white male friend of mine who is a very good colleague of mine came to my mother's funeral, first time he had ever been in a black church

where he was the only white person. He was real tall and he tried to draw up so he could get down in the crowd, please don't look at me, I don't want anyone to know I am here and at the end he said, “How do you do this everyday. I could not do this, there is no way if I was the only person”. We do that every day. So it's fear. It's uncertain, it's can I cope, and all of us ask those questions, it's the anxiety of size, we are going from small schools off into big schools. We talked about that already today. It's feelings of isolation and being disconnected, whom am I going to talk to. I get to the University of Notre Dame. I am the only black person in the School of Engineering, the only one. I am the only black person in the School of Engineering with a key. Now you all don't know anything about that if you are white. But those of us that are black know what it is like because everybody who sees you, they go “Oh my god, he has a key.” I have always said to people “I'm all right, don't get nervous, I have a key ” but am I supposed to be here. That is what we are talking about. That's everyday, every single day of your life. So you're isolated, you're disconnected, who are you going to talk to, who do you talk to? When I say that to my good colleagues who are on the other side, well they say you can talk to me. And I always say, but you don't talk to me. Why would I go pouring my gut to you when you never tell me anything. You never told me about your soul, so why should I bare my wares. So its a two way street here we are talking about.

It's the apprehension about the competitiveness of graduate education, it's misgivings about the campus itself. How am I going to get around this place, how am I going to negotiate the system, there are a whole series of activities that we have to ask about. Its access to information, its lack of a critical mass, everybody wants me to be like everybody else, why can't I be just like myself, why can't I be Howard Adams at the University. Why do I have to give that up? I have a whole history. I am a Virginian. Born there. My daddy was born

there. I was talking to a guy the other day he wanted to know what do you want, when did you come to America. Oh he said my parents came over in the early 1900's". My grandmother was born in 1809, 30 miles away from where I was born in Virginia. 1809, you didn't just get here so why do I have to give up being a Virginian gentleman as a black person. You see a big difference.

Funding, we almost invariably get outside money. Almost everybody else comes in with inside money. Inside money comes with a key, comes with a desk, comes with colleagues, comes with distinct topics, comes with all those good things that let you graduate. I have to go dig for some money, then they have to test me. You know they have to pray to find out that do we give him any money or not and the folks that got money are the ones who pray over me which is so fascinating about this process.

Barriers - acceptance, advising, advisees, new relationships, understanding charters of milestones, how do you do it, what do you have to do, the course work, who do you talk to, the journal clubs, going to research groups. If you own outside money you don't belong to research groups. You have to go find one and you have to beg to be let into one. If you come on in with inside money you automatically come in assigned to a research group. Tremendous difference.

Becoming productive. What do you mean by productivity and scholarship, and all these kinds of things. Who is going to read my paper and not think that because I got some holes in it that there is something wrong with me. Do you know when I got to Syracuse University and wrote my first paper and got an "A", the guy wrote on it, "I'm surprised you write as well as you do". What he really said is, "I read this five times and I don't believe it and I am going to be watching you". And so I went around to look at my colleagues, did he write this on anybody else's paper? I was the only one. Which meant he didn't expect me to write well. Which means I have to try

harder the next time, and harder the next time. I couldn't be ordinary. Extraordinary.

So we have to talk about finding and receiving the kind of academic support. Now what do we mean by that. In the academy what you're talking about is there is an individual student, there are faculty, and there are other students and how do I become a part of that. Who facilitates that and that is what mentoring does. Mentoring facilitates that. It makes it happen. Somebody claims me, that's my student, you see. When I tell people to go tell that them Howard Adams told you to come, bingo, the door opens. People respond, that's my student. That's a much bigger thing-so mentoring is all they say. That's my student, I belong to Prof. Wesser, it makes a big difference when you don't belong to someone. So, who do you belong to?

When we talk about this thing called productivity that's one of those things that is often a hard thing to deal with women and minorities, because we expect less of them. So we want to qualify, why there might be some problems. Let's look at that first one; Gaps and Academic preparation. We always say they are not very well prepared. What does that mean. In many incidences what we are talking about is sometimes the people we are recruiting come from smaller schools so just the atmosphere of a smaller school is quite different from a bigger school. Therefore, there are some things engrained in that. But it is not just the black folks coming from smaller schools. I was up at Michigan State and talking to the people in the Physics Department and I am trying to explain that. The first thing they want to point out is well you know a black student who comes from a historically black college is not well prepared. "So what do you do for a kid that comes from Goshen College". They went, "well what do you mean". I said, are they all well prepared? You're telling me that Goshen College is at the same level as Michigan State because if you are, I don't know why you all are in business. A student who comes from

Goshen College happens to be a white male and I already checked that out. Bill, you knew I was going to do that, so I knew they had some white males. So I asked them what did you do for him. We beat around on that for about a day and finally one of them owned up and said he had the same problem that students had from Tuskegee. There was no difference. They both came from small schools and we should have bridged the gap and we didn't do it. We just surfed over them, those students, there was no difference at all. How do you do that? Transition into the academic environment, adjusting to the graduate school, feelings of marginality, cultural isolation, lack of sophistication, being the only one, capability, a whole lot of kinds of things we go on to do.

What do mentors do in this. First of all, mentors are firm that you are supposed to be there. That's the first thing. They are firm you are to be there. They do orientation, they provide access to information, and they connect you to resources. When I come up to Bell Labs in the summertime I always tell the mentors one of the worst things we do at a Bell Labs is we bring in a student, give them a cubbyhole and don't tell anyone who is over there. It doesn't take very long for everyone to know that there is a strange person over there. Now let that be a woman they say, anybody knows who that woman is over there. They say no. And so then people start coming over to see her and you see them. "OH", and they duck. They don't want anybody to know that you looked. So here is this woman over here in isolation all by herself and everybody is coming peeking over her cube to find out who she is. All they would have to do is take her around, or the person around, and say let me introduce you to my summer student. Let me introduce you to my protégé. And I would appreciate it if you all would invite her/him to coffee. I would appreciate some of you all inviting them to lunch so they don't have to eat by themselves. It's a world of difference. Easy thing to do. We don't do

that. We just drop them in with a key, put them in a little cubbyhole and all of a sudden everybody knows there is a strange person in the place. So connections.

Survival is a skill. How do you survive in this place. I tell people do you realize that the students you are going to get at AT&T Labs and at the Universities and places, they have not had to go and stay all day. They don't have to stay all day, and surely don't have to stay into the night, you don't have to give up spring break and all of those kinds of things. So how do you give them some sense of survival?

And finally, let's talk about some goals. Let me just end with this line here. When I put this in the context of what mentoring really does this is what it is. Well I have two of them. This is what it really is. The role that they play, they become advocates, coaches, sponsors and teachers. An Advocate champions the person. That's a role. Coaches tutor, sponsors advise, teaches instruct. Functions. They recommend all of those things, but really the outcome of all these things is visibility, vision and direction. Affirmation, expertise with skills, you teach them how to time management, you teach them how to procure things, you teach them how to get their glassware bent if they don't know how to deal with the technicians. There is a whole world of lots of things we do because of that.

The main function is I think what I call my "three P's". Many of you have seen this before, and this is what we really do when we do good mentoring. Mentors give their students the edge. You give your protégé the edge. And I think all of the time this morning when we have been talking that is what it has meant. First of all, how to process, how do you function around here. How do you do things. How do you get things done - Process. Permission - Permission to function. Permission to try things out. Permission to have a key. Permission to go with me to a meeting to observe what I am doing. Permission is very important. Finally, Protection. Don't mess

with my student. Don't mess with my student, that's protection. And that's a big, big difference.

I want to commend AT&T. Really, I have had the good fortune of speaking to the Bell Labs summer students since 1984. I come up almost every summer, talk to the students. I get them in the lab with breakfast with the director, and so I watch them go through. So when you talk about them, many of them have been smiling because we have known each other for a long period of time. Let me tell you a couple of things that I think are so very, very unique about that total experience. Number one, when I come to the lab on the day those students come in Arno Penzias<sup>12</sup> always comes in when he was there. He was always there. He wasn't one of those high brow folks, they didn't even know who he was. He would come in with his little note pad and he would go around and talk to a student and say, "can I get you to do something for me" which was real fascinating. The student would look at him like I don't want to do anything, I'm not going to volunteer for nothing. So he would say OK and he would go on to the next one. And then when finally they would go "oh my god I wish I had volunteered, you know I didn't know that's who he was". And the folks he got to volunteer, that was a very different relationship. But it was just very fascinating watching him come in and welcoming people to the Labs and telling them what they could expect while they were here. The mentors and everybody else knew what was happening, that was just crucial to the whole thing. I think the last thing that it does was the rich environment that exposes students to things they might not have gotten before. My colleague is going to talk about this piece. I know I have talked far too long, I do have to say this while you're coming down, all this stuff I am talking about just about is in one of the publications that we have. There is a notebook up here if you want to look at them when we get finished.

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<sup>12</sup> Arno Penzias, VP Research, Bell Labs, Noble Prize '77



*Dr. Sheila Humphreys, University of California, Berkeley*

Thank you Howard. I have to say that I consider Dr. Howard Adams to be one of my mentors as many people in this room do, so it is a great pleasure to be sitting at the same table with him. I am happy to be here and I think I owe this to Prof. Jan Cuny of Oregon. So thank you Jan also for putting my name on the list of speakers.

I'm going to represent today a little bit about the Berkeley perspective. It is really the perspective of the Department of Electrical Engineering and Computer Sciences, which is the largest department of the Berkeley campus. But first I want to say thank you to AT&T. This is a partial list of women and minorities and majority of students who received AT&T Fellowships and who are teaching all over the country. Of course at the top of the list is Professor Lisa Hellerstein who is here today with us. Now as you know there is a great tradition of student activism at Berkeley, so all of what I am going to talk about today really is the result of student initiative, graduate student initiative. That's how things happen in our department.

I want to report to you some work that our women graduate students did in trying to determine the drawbacks in the current research advising system on the part of the faculty. With great ambition they surveyed ten years worth of Berkeley alumni men and women who came to Berkeley wanting a Ph.D. in Electrical Engineering or

Computer Science and who left the program with a Master's Degree. The response rate for one mailing was astonishing, it was over 50%. Basically the finding, the primary finding was that most students reported they left for personal reasons. They decided they didn't need a Ph.D. to do what they wanted to do in their career. But following very closely on these alleged personal reasons were issues, difficulties, and problems in their relationships with the research advisor. And so I think one of the things we are talking about today is what is the difference between a competent research advisor and a mentor. Can a mentor learn and acquire those skills, can you make a silk purse out of a sow's ear is one way of putting it.

So, these students reported the findings that they got to the faculty. In addition to the personal, to the relationship with the advisors, lack of guidance, lack of clear discussion about what progress was for academic milestones, lack of encouragement. There was also a pretty large percentage of students who found the doctoral preliminary exam too intimidating and just left if they didn't pass it the first time. The exam in itself, is one of these hurdles that Howard is talking about. It's not hard in itself, but if the student's self esteem or scientific self esteem is being assaulted by the graduate experience they are not going to want to hang around and take it two or three times. More women than men responded. They seem more anxious to tell their story but in fact there were few gender differences between the men and women who responded to this survey and the number of minority respondents was very small. There were only 7 respondents, so statistically it wasn't very significant.

So what were the recommendations that these students made to the faculty on the basis of this study. I would say the two that we haven't really talked about today are that they very much wanted to reward the faculty who were being mentors, not just competent research advisors, but mentors. I hope we can have some discussion about realistic rewards for faculty that are in fact

doing an excellent job of mentoring and developing people. These other items we've talked about recognizing differences in communication, styles, being a good listener, trying to overcome the aggressive communication style that's the hallmark of big research departments everywhere. Encouraging students to present at meetings and providing them with introductions. But over and over again in the open comments we heard the students say they did not get an affirmation from their faculty. They didn't get praise when it was due. They always heard the down side, the deficit side. They never heard compliments. That's sort of a soft issue, but I think it is something that needs to be incorporated into the training of faculty mentors. Finally, I think there is tremendous lack of availability in faculty so stretched and particularly in technology oriented departments. They also often have companies on the side. Too many advisees. They're consulting one day a week, and they are just plain not available.

So these problems were presented in our department to the faculty. So now to fix this. The next year two women, Kim Keenan who is an AT&T Fellow and Nicky Magniforie, present the faculty with a proposal for giving better feedback. They actually give them line items of ways in which they could discuss a comprehensive list of topics. These are the goals of the feedback system which I think are common to most graduate programs: to have a frank discussion, to ensure that students understood what was expected in terms of progress, identify problem areas and talk about them, this is nothing new. But out of this they created actually a two page list of items that should be discussed and both the student and the faculty member need to sign this form and it is on the web page which I will give you if you are interested. It is really quite a detailed list of things that should be discussed. We are now one year into this system and of course everybody thinks it's better, only 2% of people don't like it. What's the faculty's reaction. They think it takes more time. So the people who

are doing a good job already don't resent it. The ones not doing a good job think it takes more time. And in general, these are the list of topics, which are delineated, in greater detail on these forms and on the web site.

It is all predicated on the "T" word, trust. I think that the students, all of these items that they need to talk over candidly with the faculty cannot occur unless there is a relationship, some of you call it chemistry, but it's trust. Its being supportive, it's giving the news with kindness. In terms of this list, there's some things a little bit subtle that they want from faculty who are true mentors which are: How do they give an example of integrity in the research group? How do they give an example of contributing correctly peoples ideas and creativity? How do they give credits on papers? They really went into quite a lot of details on that and I think we have talked about most of the other things so I wouldn't go into it.

I then talked to most of the students about what is the difference between a research advisor and a mentor. A young male faculty member said, "Oh, the difference is a few beers on a Friday evening". But none of the women or underrepresented students said that and I think basically they wanted a more holistic approach towards guidance and investment in their development. So here are a couple of quotes from current underrepresented students in our program. "A true mentor inspires and encourages teaching integrity by example." "I want my advisor to identify my strengths and weaknesses and create opportunities to overcome them." Again and again the minority students say a faculty advisor will assume that because I went to Prairie A&M or North Carolina A&T there is a certain part of knowledge that I don't have that I need to do my work. They will just give me another research topic instead of creating an opportunity for me to acquire that knowledge and develop those skills. This comes up over and over again.

Also I think there is a lot of sense that the faculty in large departments, and

this is probably true here to, have their own research timelines and they like research machines and they want the students to crank out the results and publish papers. As long as they do that, then that's fine. The students are expressing they want much, much more than that. Of course, the mentoring can help to overcome the inherent discomfort resulting from the difference in status and power between the graduate student and the faculty member. Of course, Howard has talked about this using the metaphor of the key. I wanted to give you just one quote from Nicky Magnofolia who was part of this study. She said "A competent research advisor can be a think tank, but a true mentor inspires and encourages and teaches integrity by setting an example".

Now what are the differences between what students want from a faculty research mentor and an industry mentor? Those of you who are at AT&T and other places, what I am hearing is the only difference is the industry mentor provides a very valuable leveraging from outside if things are not going well within the department and the university. The industry mentor can also, of course, provide technical advice, resources, as we said this morning, and a bridge between academia and industry which is increasingly important in terms of future employment since fewer and fewer Ph.D.'s are going to academic jobs.

Here are some of the quotations from underrepresented doctoral students in terms of their views about finding mentors. "It's really hard to find good mentors, you wouldn't end up with a mentor like you, most mentors are caring but they don't understand where you're coming from or your prospective". And then there is a threat of paranoia that goes through these student perceptions. Sometimes they are not sure why the faculty member is mentoring them. Is it political, do they really believe in them, do they really believe in their talent, do they feel guilty. So I think these are kind of dismaying, and not surprising, but dismaying kinds of comments to hear in

1998. And they all say it is awfully hard to go to your mentor when you're down, when you really need the mentoring most.

From the faculty point of view, or the mentors' point of view, there are not enough mentors to go around in terms of mentors who are like those who are underrepresented or who are women. Some of our young faculty who are mentoring feel they have to do this at the expense of their own academic career so they need to keep developing themselves. They feel it is important to acknowledge and recognize that many graduate students want to give back to their community which is an unrewarded and even punishable activity when you're in a doctoral program where you're on a tight timeline. They feel very ambitious about it. We have doctoral students who work in the Oakland public schools on a science fair and some of them are very hesitant to even let their own research advisor know they are doing this activity that is sanctioned by the university. And finally, that it is o.k. to acknowledge that the academic path, the research path is not the only path.

I would like to just close with saying that you can't be a good mentor or be a good mentee unless you have tried being a mentor yourself. So we are using the aquamarine booklet which we were all given in our packet. Our chairman has gathered the six assistant professors who are all within the first and second year and they are meeting once a month and talking about learning how to be a good mentor, how to avoid sexual harassment, how to help students choose a dissertation topic.

The secondary agenda is that they themselves are bonding and creating peer mentoring for each other. Hopefully we will learn these skills so when we ask the graduate students can a junior faculty member learn how to be a good mentor, a good research advisor, the answer is they seem pretty clueless at the beginning but yes absolutely, these are skills that can be taught. So I think that would be another thing that would be interesting to talk about.

We have also graduate students who are mentoring summer research students in the summer research programs that are funded by the National Science Foundation and, as I said, undergraduates and graduate who are mentoring high school students in Oakland. So I think it is very important to build this activity in at every level because then you can be more receptive to good mentoring if you have had practice yourself. I would like to end with a quote from one of our faculty who has supervised 32 Ph.D's, a quarter of whom have been underrepresented students. He sights three provocative challenges that could also be discussed. He said he feels the special issues in mentoring underrepresented students are: 1) overcoming a perception that they are isolated and under special scrutiny; 2) overcoming a perception that they are being treated in a privileged fashion for non-academic reasons; and 3) for women addressing the deep concern they have about the biological clock and rearing a family and that kind of issue.

So with that I would like to close and thank you very much.

### *Discussion*

Moderator: Wesley Harris -I would like to thank each of the panelists for their presentation and we have maybe ten, fifteen minutes for questions if there are questions from the audience.

Tiki Suarez, AT&T Labs Fellowship Recipient - Thank you, my question is posed for Dr. Sheila Humphreys, my name is Tiki Suarez sorry, I just wanted to see if you could give us that http site. the web site.

Sheila Humphreys - Yes I can. If you go to <http://hera.eecs.berkeley.edu> you will get to it. It is our department comp page.

Moderator: Wesley Harris - Other questions. I have a comment while you are gathering your questions. This morning Wulf and Spight made some comments which I agree with on complexion: the state of poverty within engineering design due to

the fact that there is not a diverse presentation of options to begin a project or activity. About a year and a half ago four black male full professors at MIT met at a restaurant at the Marriott Hotel to listen to another black male faculty member to present to us some problems he was having at MIT. And it was hard because it is rare to get that many black faculty members at MIT at any one time, that's like getting 100% attendance. The faculty member had a problems which he explained this way. He said he was at a reception given by his department head and he introduced his wife to the department head and when the black faculty member and his spouse returned home the wife complained that she was ignored. And that was a problem for the family. And this black male faculty member wanted to tell us that his wife was ignored. One of the senior black faculty members not in the department of Aeronautics and Astronautics but senior still responded this way. He said, "That's interesting, Joe, but you know, damn, they actually ignore me too". And I thought that was a rather profound statement. At the highest level, having received all of the perks that MIT has bestowed upon a black faculty member in the school of engineering, when it comes to complexion, when it comes to adding true value in terms of diversity at the planning stage, at the design stage, we are still ignored. So it's not the what, ladies and gentlemen, it's the how, it's the how. We all agree that complexion is important but how do we get it done. Now maybe MIT is singular. Maybe at Berkeley and Arizona, if a black or Hispanic or women faculty member were to come to the table with a truly new design concept it would be accepted. Believe me, solutions coming from us at MIT are not accepted, but, in fact, ignored and that in fact is the real underlining theme by what I mean for normalized for racism and developing my own group of scholars at MIT. Because I knew that every single idea that my students would put on the table would be given full consideration. So it is time really for us to

peel the onion a few times and go beyond just what we want but the how to, its very, very important that we do this. Any other comments or questions for our speakers. Yes Pat.

Patricia Wirth, AT&T Labs - I appreciate the challenge that Professor Harris gave us at AT&T. I think in your opening remarks about examining where we are with our program at this point in time and seeing what we need to change, and how we need to grow. I believe this was a fair statement of your challenge. My question to all on the panel would be having heard what you've heard this morning what you know about our program, do you have feedback for us. Do you have suggestions for us and our program and how we can grow, improve and extend the reach of what we need to do in the future.

Sheila Humphreys - I would just like to say, please continue to do your program because in the state of California we are not allowed to administer or initiate such programs ourselves. So the fact that AT&T has a program which particularly supports women and underrepresented students is of inestimable value. Strategic as well as actual.

William Velez - I think that programs such as this are extremely helpful to us to work with undergraduate students to show them that there are opportunities for them if they are serious about their studies. One suggestion might be that you seek out individuals who are having an impact on the local minority community and use these as resources to solicit applications from their students.

Howard Adams - My suggestion would be one of to echo yes do what they said. I think one of the important things that might be here is to tell your story better. I don't think you have told your story very well. There are lots of companies out here who ought to be coming to the trough, but don't have the value that you had. One of the things that I

did not say when I was up there talking, I would use you all as the example. I'd always think that the students that I was talking to that to be a member of the technical staff at AT&T Labs you have to go to grad school. And you validated that because you sent people. I mean, it was a value that you put on that. There are many people out there who are telling students who come to us, they are our very best students, and they tell them not to go. So we are sort of voices in the wilderness trying to compete with a company who has a job with all of this added. So I think to go tell the story of not only did you do it, but to identify these key people who went through and are making these kind of serious contributions would be something that would be very good. Now, that's not a negative when I say you haven't told your story very well. Many of us haven't, we haven't done as well in the GEM program either. What I am trying to say is we should let it be noted that there was this value to it. That it was not that we put this money in a rat hole and it went down the drain and there was no value. You have live, kicking, screaming people who are now doing these kinds of things. We need to publicize that this in fact is happening and the good of that overall would add some value to it and I think that would give us some reason. What happens to those of us who are in the trenches where we are: we are trying to justify the existence of stuff from afar and we don't weigh enough to be honest with you. We do get stuff at Berkeley, but the weight of that needs to come from someplace else and for you to be a voice would make a big difference.

Moderator: Wesley Harris - Pat, I would challenge AT&T to better manage risk. Success, two thirds, why don't you enlarge the pool? I don't want to be so presumptuous as to say once you pick winners they are bound to succeed. But given your success, better managed risk, enlarged pools. Yes-----

Hrair Adlermeshian, AT&T Labs - Let me just make a couple of suggestions. Taking your challenge, Howard, of doing this with other industries players. I would encourage you to actually put those companies in touch with us. I'd like to comment that we would work with them. Show them what we have done, give them the results and attempt to get them to do the same kind of thing we have done here. I think in answer to your question, Dr. Harris, we would then be able to probably multiply these numbers in a much bigger way than attempting to increase the numbers at AT&T. I'm not suggesting we wouldn't like to do that. But I think if we attempt to do this in a bigger way in industry we would be able to get much higher multipliers.

Sheila Humphreys - Could I just make a quick comment. I think that it would be very important in talking to other industries who create fellowship programs to make two points. One is that the mentoring component of the AT&T programs has always been really a model for others and we always use it as an example of the one that's been serious about mentoring. But the second thing is, I've noticed in the new fellowship programs they are (a) not on the scale of AT&T's, but (b) the goal is clearly and explicitly to create employees with advanced training. It's not to feed, it's not to create a pool of people who have advanced training who may or may not work for AT&T.

Carol Muller, WEPAN and MentorNet - Pat, if you don't mind I want to respond to your question because one of the things that I always think about is, "are we really changing the system". I think with the kind of success that AT&T has been offering and its record and its permanence, that there probably are opportunities. Some mentors have alluded to ways they have been able to intervene to help specific students, but to put a little bit more pressure on colleagues in universities to do better in creating a climate that supports women and minorities

so that the support which now comes from outside in many cases can much more often be found inside.

William Massey, Bell Labs - I just want to comment on what Howard Adams was saying in terms of either AT&T, Bell Labs, Lucent, telling the story. I think you have been much too kind and polite to us. I personally think that having gone through the break-up of the company and then basically having to reinvent the program on the Bell Labs side, I feel that the company has done a horrendous job of telling the story. That I was just shocked at how few people knew about a program in-house that has been in existence for twenty-five years - much fewer people outside. And I think for both, the friends at AT&T and us at Lucent, we need to do a far better job of talking about the successes of the people, about talking about who is in the program, what people are doing, where they are going, and the overall impact. In fact with working with the program, because I work in research and this is the closest I have gotten to marketing, I understand a lot of aspects of selling an idea that I never, never understood before.

Moderator: Wesley Harris - Bill, I wouldn't be so kind. If you really want to get the message out, Bill, why doesn't AT&T insure, guide, nurture one of these fellows to replace Armstrong?

Howard Adams - I was going to say one of the things that I think just to give you some ideas. If you're sitting there now thinking about how to do something like this. We, those of us who are in the trenches doing these kind of activities, continuously talk to each other all the time. We can't get this on the main agenda. AT&T, Lucent Technologies can get this on the main agenda. This can be a discussion at the Academy of Engineering. It can be a discussion at ASEE, on the main agenda. It can be in the planner session. We can get it on the program, but it is always down the hall and people don't come to the session.

You can get this at the Dean's Council Meeting, where the deans meet in Puerto Rico and they wouldn't let me come. So that's the kind of thing you can do, you can get this on the main agenda if you decided to put it at that level. So when I say you haven't told your story very well, don't tell it to me. You don't need to tell the story to me. You don't, we don't, really need to tell it to most of the people in this room. We need to get it on this larger agenda. One of the sort of pervasive things that is going on through the country right now is this is boiled down that this has been a specially focused program to undeserving folks. So we are in a position where this will die. These were not undeserving folks, but they were folks that were not served well. But this program served them well and because it served them very well they did exactly what everybody else would have done who was treated the same kind of way. You could get it on the main agenda. To bring it back into this room again will do us no good. We have to get this into the Academy of Engineering, the Academy of Science, into ASEE, national meetings, the Chamber of Commerce forum, the business round table. This is where the story needs to be told. That you took very good people, gave them the kind of support you would have given anyone who was very good, gave them momentum like you would have given anybody and they rose to the top just like everybody else did. Here are examples of them: they have tenure, they are vice-presidents, they did all the kinds of things that your talking about. That's what we mean when we say that.

Carl Spight, Jackson & Tull - I am tempted to defer except that you made something very challenging as an observation, Wes, and that was this notion of managing risk. It is important to observe that some of the ability for this process to digest its own history is related to how it sees itself and how it communicates internally. The Lucent, AT&T dialogue may be a problem here in terms of this notion of whether this

program has in fact managed risk. There is a period of time, and I tried to point to that earlier, from '75 to around '85 when Bell Labs in this case was taking very audacious moves with respect to bringing a larger playership to the arena. It was exploring the possibility that some of these smaller institutes, such as the historical black colleges and universities, might be rich feeding ground for folks ultimately to matriculate to the Ph.D. and have successful careers. My sense is that that history has not been digested internally. What lessons have been learned, why does it no longer do that at this point, what in this period of retrenchment, downsizing, resizing, the new pragmatic has informed the politics as it were of that kind of risk taking. This marvelous celebration, occasion the web page, one that has a fair amount of information, that has an agenda, my sense is there is an opportunity still afforded for this dialogue. One would want to see the history of the program presented, a much more adequate, a much more edifying history of the program, as part of the web page that is residual. My notion is that a part of this history of risk taking, the lessons learned, success and challenges and failures can be told. The results can be discussed, presented and scrutinized. They form bases for forming policies on opportunity formation. So this notion of risk, this program has gone through a number of water sheds, I used to call them when I had an occasion on a yearly basis to reflect on back to where we are at the end of the year. A number of watersheds, that period of ten years is edifying and is an unexplored opportunity for this program as it goes forward. That history is still living, still alive in many of the mentors and the mentees and in many others who play in that arena in that period. Risk taking was a part of the program, it is not that now.

that you provided back and forth. Thank you.

Prof. Wesley Harris - Thank you Carl. I would like to thank the panel again and the audience for your attention and stimulation

## Keynote Address

*Moderator:*

Dr. Richard Roca, VP, AT&T Labs

*Speaker:*

Robert L. Mallet, Deputy Secretary of Commerce



***Robert Mallet, Deputy Secretary of  
Commerce***

Good-evening ladies and gentlemen. - I did not travel all of this way to see an unfriendly audience. They told me you have had such an extraordinary day.

Well I spent about five hours trying to get here to spend this one hour with you. The issues that you dealt with today and spent some time thinking about, I care a lot about. The Department of Commerce cares a lot about. Secretary Daley has talked a very good bit about, as has the Vice-president and the President. So I felt it was very important that I come to learn and participate in the activity with you.

You know, annual reports are always interesting and not only because of the numbers. The other day I was looking through the AT&T Annual Report. That is not because I own stock at AT&T; I do not. I came across a very interesting story in the letter from your Chairman and your

President, Chairman Armstrong and President Zeglis.

They related their situation to that of Winston Churchill in 1942. After Great Britain won a great victory in El Alamein, North Africa Churchill said, and this is quoted in the AT&T Annual Report, "this is not the end, this is not even the beginning of the end, but it is perhaps the end of the beginning". Your Chairman and President see this quote as relevant to AT&T, upon completing trivestiture AT&T is at the end of the beginning.

There were those who thought that AT&T would not survive. There were those who didn't think it would ever recover from the 1984 breakup. But you learned to compete, you looked for new business, you spotted the potential in mobile communications, you became a player in the Internet. In fact I was reading Megatrends the other day. It referred to AT&T as the comeback kid of the late 20th century. Now in this 150th anniversary since the birth of Alexander Graham Bell you are indeed at the end of the beginning.

We can say the same thing about this celebration of AT&T's 25-year commitment to bringing women and minorities into science and engineering. It is a noble calling. The figures speak for themselves. Almost 200 of the AT&T fellowship recipients received their Doctorates over the last quarter of a century. You see the fruits of this program when you look at the corporations like one of yours, like Lucent Technologies, where Dr. Wayne Hunt is a vice-president. You see it in the schools, like New Jersey Institute of Technology where Dr. Anthony Johnson is Chairman of the Department of Physics. In a way, your success points out the dimensions of the problem you have been dealing with today. For AT&T to have such an extraordinary effect, is to point out how few others are doing likewise.

In fact, the number of minorities in science and engineering is distressingly small. How many African Americans earn the Ph.D. in Mathematics in the United

States? In 1992, the year for which I have the latest figures, only 4. In fact a male African American has only a one in four thousand chance of getting a doctorate in Mathematics, Engineering or Physics. In all of the major engineering and scientific fields of study, minorities receive only about a hundred doctorates every year. Now you know these figures.

Dr. Patricia Wirth asked me to come here today, "to provide a larger context" for the problems that you have been discussing. Well I don't know if she came to the right person, but she certainly came to the person with the right job. As Deputy Secretary of the Department of Commerce I wear a number of hats. Part of my job is to look at where our economy is going over the next fifty years and to determine where the jobs will be when I am in the winter of my life. Therefore, part of my daily work is to look out across the decades and imagine what the world is going to look like. What it will be like at the very near end of my lifetime.

Now were there people in government in 1888 and 1889 who did the same thing? Sure there were. Would they have predicted some of the things that we do and know today? How could they have seen a world in which Alexander Graham Bell's invention would be a staple in every American's home. They would not have imagined that people talk to someone on another continent using a gadget that fits in their jacket pocket. Would they have thought that two bicycle repairmen in Dayton, Ohio would go down to Kitty Hawk, NC and find a way for humans to fly? Or thought that a German High School student, struggling through math, would conceive of a theory that would give us the means to power the world or destroy it.

In 1899 a man named Charles Duwell, a man of extraordinarily limited vision, and who coincidentally was Director of the U.S. Patent Office, said, "everything that can be invented has been invented." He was head of the patent office! Nobody proved him more wrong than the people working in AT&T Labs over the last century. Of course the

changes we have seen are more than technical.

Who would have predicted, for example, that the Irish, Italian, Jewish immigrants pouring through New York's Harbors or New Jersey's ports would add so much talent, energy, and initiative to America. Who would have predicted the cultural change that would allow African Americans excluded even from the basics of everyday American life, schools, voting, or a seat on the bus, to become members of Congress, Cabinet Secretaries, military leaders, and corporate officials. But before we become so smug about Charles Duwell's remarks and his limited vision, we should think about how much of our future is unknown.

We can foresee two things. These two things I deal with everyday. First is the telecommunications revolution. It is revolutionizing the way we work, and speak, and think. When President Clinton was sworn into office there were 50 websites in the U.S. We now have 50 new websites every twelve hours. Four out of ten homes in this country have a personal computer. When I went to college I took a typewriter. Last year Americans sent more email than the post office mailed letters. More than a billion emails every month between some 35 million-computer users. Everyday we spend 18 million dollars on computer software, we spend only 6 million dollars on books.

When I was growing up, America was a manufacturing based country. In Houston my father went to work making steel at the Armco Steel Plant. The Armco Steel Plant is closed now. I had other friends whose fathers, and they seemed to always be fathers in those days, worked construction for the oil companies. In Detroit, Americans who returned home after World War II got jobs on the assembly line at Ford, Chrysler or GM. These workers helped to create a new prosperity.

Today plenty of Americans still make cars, but even more build computers. Americans still drill for oil, but more work in data processing. Americans still work

construction, but even more make semiconductors. What is our hottest and fastest growing industry in the U.S.? It is Software. While most of us still go to the store to buy food, cloths or even a car, the value of goods and services traded over the Internet between nations, has gone up a thousand percent over that of a year before. By the year 2000, 46% of Americans will be spending about \$350.00 a year over the net. What does this mean in terms of jobs? First, we will need about 1.3 million new workers in information technology in less than seven years.

Certainly nobody needs to be lectured about what's ahead in telecom in this audience; you know that. You know that this is a world where there are more phone lines on the Island of Manhattan than the entire continent of Africa. China plans to build out service areas about the size of a Baby Bell each year. The biggest opportunities for telecom companies exist not in the United States, but outside our borders.

You know that those who graduate from school without science, math and computer literacy will be totally left out of the job market in the 21st century. So how are we doing educating the next generation of American workers? How are we doing when it comes to making sure that when we travel the information highway, we have on-ramps for all of our young people? That our girls will not lose interest in math at the fifth grade and let the boys excel before them. That we don't lose black children in school by the time they hit the third grade.

How are we doing? Well the answer is, we are not doing terrifically well. Right now there are three times as many white families who have computers in their homes as African Americans and Latinos. Schools in 78% of the affluent communities have Internet access. Only about half of the schools in low-income communities do. We simply can not find acceptable a society divided into information have's and have-not's. That is why the administration that I work for has taken an aggressive step to

insure that all of our children from kindergarten on up become computer literate and have the tools to participate and grow in the information age. The E-Rate as you know is the discount for telecommunication services to our schools and libraries and it a central part of this strategy. To see that the haves and have-nots do not divide along race dovetails with the second hat that I wear as Deputy Secretary of Commerce.

Another part of my job is managing the Census. The Commerce Department is the home of the United States Bureau of the Census. We look closely at population numbers and demographics. We can project that within our lifetime by the year say 2050, we will be a nation that is almost 50% African American, Latino and Asian. Why is this? One reason is that, just like a century ago, we were in the middle of a great wave of immigration. Almost 10% of Americans were born outside our borders, the highest number in 50 years. In the 1890's most of the immigrants came from Europe, now they come from Central and South America Caribbean, Mexico, Philippines, China and Hong Kong. They will not change the character of America, but they will change its complexion and its face.

Now if we wanted to be mean spirited about it we could find ways to leave folks behind. It's easy to forget about the powerless. It's easy to forget about the people who don't have lobbyists, but how do we make it hard for us to forget this segment? How do we make sure that opportunity is present for all Americans?

Part of the answer lies in this symposium, Mentoring for Success. Anybody who has been successful at anything knows what mentoring is even if you have never heard of the word before. The only way you get to be what you are is you tell somebody what you want to do and somebody, somewhere, cared about it. It works. Mentoring works. You've seen this with the AT&T Fellowship program. You've learned that it is not enough to pay

tuition or book allowances. You assign mentors to each AT&T Fellow, I understand. That gives them the benefit of working with an experienced scientist, it gives them guidance, it gives them the human touch, it gives them nurturing. It opens doors. That is why when Dr. Charles Thompson at UMass Lowell talks about this program he doesn't just talk about money, he talks about the way he got help, and advice and support.

Mentoring doesn't just work with graduate students; it works for all people. You know last year President Clinton along with former Presidents and former Chairman of the Joint Chief of Staff Collin Powell held a conference in Philadelphia on volunteerism. It was really an extraordinary event; it was quite remarkable. For three days in Philadelphia delegates gathered from all over the country to examine ways to encourage volunteers to help solve the most urgent problems facing America. One of the main goals of the conference was this was an ongoing relationship with a caring adult, a mentor, a tutor, or a coach or teacher. The delegates in Philadelphia knew what you have put into practice for over 25 years: that if those of us who have become productive citizens want to give something back, there is no better way but than to be a mentor. You see that when you study a program like Big Brothers and Big Sisters you can see the results. Big Brothers and Big Sisters is the oldest mentoring program in the United States. When researchers look at the results they find that little brothers and little sisters learn a lot from the big brother and big sister. They are less likely to use drugs; they are less likely to start drinking; they are less likely to hit someone; they are less likely to skip school. They are more likely to do their homework, more likely to learn, more likely to graduate, and that is why I am so very proud of what my department, the Department of Commerce, is doing in this area.

Every Saturday morning out at NIST when kids as young as eight years old, as old as fifteen, they come to the National

Institute of Standards and Technology, NIST. This is a place where we have more engineers, physicists, and mathematicians than anywhere else in the department. They learn hands on science in physics, computers or biology. Now, we have various mentoring programs at the Department of Commerce that is why I am so proud to be there. In fact in my briefcase I took a look at the list and we have hundreds of these programs, internships, grants, science kits, partnerships with schools and corporations. I would love to give the Clinton Administration credit for these programs, but the fact is everybody deserves the credit. When it comes to inculcating a love of science and math in children, everybody benefits.

What I hope happens in the years ahead is that Americans learn that mentoring is not just something that forms part of the program run by a large company like AT&T. It is something for everyone, it's something we should do in our churches, and temples and synagogues. It's not something that just grad students should do in math, or to earn money. It can benefit a six year old just beginning to learn how to add and subtract, or who needs somebody to take him or her to a ball game.

I wanted to bring my son here today. In fact, I wanted to bring him to work with me today, this, I believe is take your child to workday, it used to be take your daughter to work. They have expanded to take your child to work. We have a terrific program at the Department of Commerce for the children today. We were simulating a hurricane in our lobby from our scientists from the National Weather Service. We had scientists from NIST who were going to show them cold technology and cryogenics. We were very excited about it. But then you invited me to give a speech, the President invited me to lunch, my kid had to stay home. But I believe in thinking positive and the fact is our young people are learning a lot and he is learning a lot where he is. I chuckle sometimes when I look at him on our computer at home. He knows how to

use that computer far better than I do and I thought I knew a little bit about computers. Every time I get in trouble I don't call my wife I call him. He is the family technician. I think about his use of the computer and when I went to college I took an electric typewriter and I knew I was up to date and up to speed. He doesn't know what a typewriter is.

It is an extraordinary time in which we live. I read an article in Newsweek recently. It had the results of a poll that compared six graders with Fortune-1000 senior executives. I hope none of you sitting in this room took this survey. 53% of America's top bosses thought that an Arch Deluxe was a PC part; 98% of students identified it correctly as a McDonalds sandwich. Only 23% of the executives could explain what a modem is compared to 93% of six graders. While 98% of the students knew that the Internet isn't owned by anyone, 68% of the "suits" thought it was controlled by a corporation. 23% thought it was controlled by Microsoft. Maybe kids are not the only ones who need mentors.

I come here today to help you celebrate twenty-five years of achievement. There are many achievements ahead of us. As you honor Ted Eckberg and David Johnson and you give them your symbolic appreciation by an award, challenge them to help you point to the achievements ahead. Nobody should think that it would be easy. But if more American corporations are willing to emulate what you have done since 1973, I am confident we will succeed. We will create opportunity where there had been obstacles. We will bring into society those who have been shut out. We will empower those who feel powerless. When we look back on this symposium, this time in our history, when we are at the evening of our lives, we can say that it marked not the end, or even the beginning of the end, but perhaps it was indeed the end of the beginning. Thank you!

## *Discussion*

Question - The Department of Commerce, as I understand it has a whole new program dealing with training for technology in the future. Could you say a little bit more about the status of that?

Answer -Well I would not to be quite as optimistic yet to call it a program for training for the future quite yet. We are looking at a number of items now and we've done now a series of workshops. We will continue to do some town meetings around the country to talk about information technology and training. We will discuss the need for it and the shortage of information technology workers.

Out at NIST we have some programs. We are in the middle of the budget season and we are beginning to think about how to impact this issue of technology in the year 2000 budget which we are preparing for. And we are giving some thought to a number of things. One of those things we are simply discussing internally now is that we have these empowerment zones all over the U.S. that we have extraordinary competition for. Most of the zones are run by, the award is from, the Department of Housing and Urban Development. We have the Economic Development Administration at the Department of Commerce, we have the Technology Administration, we have the Patent and Trademark Office and we have the Economic Statistics Administration. What we're learning is that these are information driven agencies: that there is a vast unevenness in communities in terms of their technology infrastructure. We are looking at the idea of creating technology zones all around the country to see if we can not encourage this so that we can take away some of the unevenness about Internet access and the like. So we are exploring these ideas. These obvious programs that we have but they are not as we would regard as high impact programs yet.

Question - I wonder if you could remark on the task of trying to bring minorities and

women into Science and Engineering in the context of the current backlash against Affirmative Action programs per say, reinforced by your remarks that was one day out of the year reserved for bring daughters to work which has now become bring your child to work.

Answer - Well, one of the things we can do with our children, I'm certain you've talked about this, the things I have now read about this problem is that girls are discouraged from math and science around the fifth or sixth grade. We begin to see them lose interest and this doesn't matter what racial group they belong to, it's true across the board. Now that may be changing and it certainly changed in a lot of the other areas like law, half the law graduates are females and medical schools are changing, but we are still having difficulty retaining girls. Minority children, in particular boys, this is in both Asian communities, Latino communities and certainly African American communities get disengaged very quickly. In fact, the research suggests that when we see a troubled child and we have not corrected that behavior by the third grade, we can predict fairly well where that child is going to be, what that child's lifetime chances are. We have to do a number of things: we have to invest more in math and science education. The National Science Foundation is trying doing some of that by giving some of its awards to training math teachers, we have some horrible teachers out there now, they discourage children from being interested in math and science. That's one, invest in education.

Second, upgrade the quality of the people who teach math and science. One of the most remarkable things is to go into an inner-city school and you find a teacher who has imagination, who has interest, who has captured the imagination of the children, and find how well they do in math and science. We have example after example, if the person who introduces you to the subject infects you with their interest and enthusiasm in the subject they can retain

your interest. So that would require an investment in education, teaching teachers how to teach these subjects. I also believe we ought to do one other thing. We ought to bring people like you out of the labs and into the classrooms to show people what the possibilities are: that Math and science education is not pure abstraction, to demonstrate to people what is important, sort of how this is important to a profession in these number of fields. That's the second thing I can do.

The third thing I think we should do is to look very, very seriously at how we - The last time I said this it was very extraordinarily controversial so I am trying to rethink how I say this because I want you hear me and not reject my thoughts. Affirmative Action has been an extraordinary gift to this country, an extraordinary gift. I had an uncle who used to like to say that what black people have brought, has done more to raise the standards of American education than anything else. The reason for that is that we didn't have all of these tests for entry purposes until there became a vigorous desire for minorities to go to graduate school and colleges. One may see Affirmation Action in the context of a tool that may be used to insure the economic vitality of this nation. When all of its people are productive citizens and when they gain entry and opportunities into institutions of higher learning and into corporations, that is a benefit for the nation. The way to get them there, one of the ways to get them there that we know is a success is Affirmative Action. It has not always been properly executed and carried out but the one thing we know is that this room wouldn't have looked the way it looked if it weren't for Affirmative Action. For your affirmative efforts, in your mentoring programs, that's affirmative action. To make people understand that diversity is in fact the strength of our nation. That as we look at where the opportunities are: in telecommunications where we now know that 80% of the people in the world don't have a telephone, that's not true of the

U.S., but 80% of the people in the world don't have telephones; 50% of the people in the world are two hours from a telephone and another substantial percentage is days away from a telephone. Where are these people who live like this? They are in China, in India and in Africa and some in Latin America. The diversity of this country makes us far more competitive than our European counterparts. So embracing Affirmative Action as one tool to use to strengthen our capacity in engineering and science is something I think we ought to do. I cleaned it up a little bit from what I said the last time. I didn't lose anybody.

Question - There is something that the Department of Commerce can't take action on but it appears to me that you are in a strategic position to highlight the problem. Thereby you may challenge others to do something about it. Americans have traditionally taken out 90% of the new patents. This number has steadily declined. I understand that this year it will probably be below 50%. The second part is, Blacks have had a disproportionate number of patents. You are the one responsible for collecting those data and it can be passed on to inspire some of the young. This information can be used to inspire the corporations that are developing programs to reach out to the increasing minority population. This will help them to be competitive in the next century and inspire industry to use an untapped resource.

Answer - We do have the Inventors Hall of Fame at the US Patent & Trademark Office which is a part of the Department of Commerce. We are trying to do more, the Commissioner of Patents and the Trademark Commissioner is trying to do more in this regard. As you know the Commissioner of Patents is an African American & the Commissioner of Trademarks is African American. I bet most of you didn't know that! There is an overarching Commissioner of both offices who has taken a very keen interest in the

Inventors Hall of Fame: that we begin to bring more attention to the contributions of innovators of this country. Frankly, we have not done a good job of talking about women or minorities who are innovators and inventors and perhaps we can do more and we will begin to talk about more. That is something I know we have talked about internally.

Question - Can you share some of your ideas, thoughts and dreams on how this program can be emulated in other institutions and corporations not necessarily by force but by choice? In addition to that, the reason I ask the difference between force and choice is because there is a lot of affirmative rhetoric but negative action.

Answer - Well, this program only works if there is a commitment by the institution. There have been programs that were started in lots of companies, but there was not a firm commitment by the institution, by the corporate body and its leadership. Its leadership from the very top must be certain that they understand that these values are important to an organization. This is the only way you are going to have a successful program like this that people believe in it and that you can not stop it when you have some failures. It starts with leadership in creating an institutional infrastructure that maintains a program like this no matter who the leadership personage is. That's the only way you can do it. Second, you have to put resources into this. This is not a cheap proposition and it is a long-term proposition. We can not be blinded by short-term profit margins; this is a long-term proposition. This is one of the things you do to be a good corporate citizen. That is why AT&T has been so successful at this. It is clearly a very good corporate citizen in this regard. It has made its commitment for a program like this for years. If you don't have that kind of institutional leadership you will not have a successful program.

Question - My comment is that the history of this program, as far as I understand anyway, was because of what the Affirmative Action agreements that AT&T had entered into with the government at the time. Now, I think the people who became involved in the program realized very quickly the advantage to the company of prolonging this. I don't think that's anymore an issue now. But coming from that model, something that was initially a legal requirement became something that was very much a part of the culture of the company. I am just wondering if there might be a model that would be applicable in other situations.

Answer - Well I wouldn't want everyone to sue to get a program like this. But you see what I mean about raising standards and making a significant contribution to the country. The litigation posture these days is very unproductive in my view. Obviously there is still a need for it and people will do it. But if we can sort of encourage more companies to talk about this and more corporate executives to make programs similar to this a part of their corporate culture we will all benefit. At NIST we have done a good bit of work in this area and scientists who are an extraordinarily wonderful group of people because you can almost confuse scientist, and I know I am talking to many today, with monks. They go in their labs, they do their work, they don't seem to communicate with the outside world a lot. In fact, there is a stereotype of scientists and I have gone into many labs. But scientists are the most enthusiastic people about other people learning about their work. Every time I go into one of our labs in Boulder or in Gathersburg, whether it be the labs in NTIA or NIST or NORA, I am always fascinated at how welcoming scientists are and how much they want me to know about what they did. Dr. William Phillips is a Nobel Prize winning Scientist and he works at the Department of Commerce in the Physics Lab at NIST. And I just casually asked him one day, "what did

you do to win the Nobel Prize". He was so engaging and he said "You really want to know", I said, "well yes, don't make it a lecture but I really want to know". I find the best ambassadors for programs like these are the scientists themselves. Going to universities, talking to the students, going to colleges, they are the best ambassadors. They don't know that, they don't believe that, but they are because they have a tendency to talk about their work with a passion that lawyers don't talk about their work. They think that they make meaningful contributions in ways that others don't. So I actually think that if we could drag some of you out of the labs and into our public schools, you will be surprised at the reception you will receive.

Question - Can you comment on some of the new creative things that you are thinking about in regards to involving more underrepresented minorities and disabled people in the census 2000. Especially with the use of technology and especially with the census information center at CIC, especially opening up some opportunities for students to do internships, etc.

Answer - Well yesterday I participated in the first meeting of the President's Task Force on Disabilities chaired by Secretary Herman and former Congressman Tony Cuelho and we got really pumped up about ways to really improve our efforts with respect to people who are physically challenged. The census, who would of thought that the census would be controversial. It's now a major bru-ha-ha. And that is around the sciences. After the 1990 census which was the most inaccurate and costly census in modern times. Of course we only started doing the census by mail response in 1970. After that census was taken, the Congress and President Bush asked the National Academy of Sciences to identify ways in which we could improve the taking of the census. One of its recommendations was that we do statistical sampling to improve the count, to improve

accuracy. The largest group of people missed in the 1990 census was the children. The children were missed regardless of their race. The highest ethnic group missed was American Indians on reservations. Followed by Hispanics, African American and Asians. We counted suburban people better than urban people and urban people better than rural people. We missed people who lived in apartments more than we missed people who live in homes. It's really an extraordinary thing when you look at the statistics. We missed teenagers more than we missed adults. So statistical sampling is a scientific method that statisticians say is the most scientifically proven method to make the census more accurate. We are now in a major bru-ha-ha with the Congress to allow us to do the census by using sampling. Now we will enumerate the overwhelming majority of people, we will send 116 million census forms to households around the country and I urge every one of you to send it back. When you send it back it is much cheaper for us. We will allow you to file over the Internet. We want to encourage mail-back. The higher we can get the mail-back rate, the more accurate the census will be. After the mail-back we send people out for what we call a non-response follow-up.

Then we have statistical sampling, which allows integrated coverage management. It is methodical, very complex, and I can't explain it all but I do understand what we are trying to do. We have to hire 260,000 people to do the census and we have to do that with the unemployment rate today what it is, it is a major challenge. We have opportunity for people and we are going to have another one of our training programs. A major training opportunity particularly for people who join us to do some of this work. We want to target some of our work for people who were formerly on welfare. We want to bring a number of them into this job and train them on how to use a computer, it's part of our work. We are purchasing 25 thousand laptop computers where we are going to

train a number of the people on how to use them, how to be good enumerators, and give them a voucher to get additional training. We're trying to be inventive about it, so that's one of the things we are doing. If we are not permitted to do sampling, if the Congress blocks us from sampling or if the courts stop us from doing it, we are going to have to hire 360 thousand people. This is another 100 thousand on top of the 260 thousand in our plan. We would have to send people door to door to help us finish the census. That is inefficient and it will not result in a more accurate census. And it will not allow us to give people the kind of training that we think they deserve in a technology driven economy.

Question - In the spirit of the day did you have a mentor that changed your life?

Answer - Well I didn't have one mentor. There were probably in my life a number of people who influenced it. But first and foremost I was very close to my grandmother. My grandmother finished the sixth grade, that's all. She was born in 1897 during the depression. She was an extraordinarily smart woman who had a very, very strong belief in education. She lived near us and we were never allowed not to go to school. The only time I remember missing school was in the second grade. I had the mumps. But she was a significant influence on my life about what education can do for you. That's one.

The second was my father. My father, the one thing, he gave us many things, and he yet lives, but the one thing he did for my brother, me and my three sisters was that he taught us the value of work. He'd go to work and he hated his job. He hated going to that steel mill everyday. It is one of those things I didn't think about till I was an adult. That is when I started getting up going to work everyday. How I hated getting up and going to a much more comfortable job which was far more challenging to me. A job that made me feel full as a person. My father did it without

complaint and I saw him do that everyday. And for some reason that sort of stuck with me. That was a mentoring relationship without me knowing it.

There was my sixth grade teacher Mary Wesley who taught me everything I know about the use of the English language. Who taught me to love language? Felix Cook who was the first professional African American man I saw wear a suit to work everyday. He was a principal of my High School.

Well this has been extraordinarily educational for me to come. I had hoped it would be more instructive because I had planned to be here for the second half of the day, but I was unable to do that because of our flight schedule but I deeply appreciate having been invited. I hope you will think of me again.

## **AT&T Labs Outstanding Mentor Award**

*Moderator:*

Dr. Hrair Aldermeshian, AT&T Labs

*Presenters:*

Dr. Louise Brown, AT&T Labs

Dr. Sandy Frasier, AT&T Labs

*Awardees:*

Dr. Ted Eckberg, AT&T Labs

Dr. David Johnson, AT&T Labs

### ***Dr. Hrair Aldermeshian, AT&T Labs***

Now lets get to a very exciting part of our program. It is awarding the 1998 Charles Thompson Mentoring Award. The AT&T Labs Fellowship committee created an award to recognize an employee of AT&T whose service as mentors is outstanding, whose contributions have made them role models for others to emulate. Among other characteristics an exemplary mentor will have built trust with a protégé, provided technical career guidance, and most important, made a difference in the future of that student. In addition to a commemorative plaque, the outstanding mentor will receive a cash award. During the past few months the committee solicited inputs from the students, current and past, and said they would make a determination. We came up with two awardees Drs. Ted Eckberg and David Johnson.

Before we make these awards let me tell you how we came about naming the award. And this was an interesting experience. As with all awards, this award is named for someone who is truly exemplary, and is an inspiration to others including the mentors and other folks that would like to be mentors. Often awards are named for

someone who has passed or retired. So when I had the pleasure of calling the person and saying we wanted to name this award after him he said, "wait a minute, I am not dead". No, we broke the tradition. We wanted to name the award after Dr. Charles Thompson. We did this because he has been in this program for roughly two decades. First as a student and most recently as an academic advisor. As I indicated in our panel discussion he was one of the people, along with a number of others championing within AT&T, behind making sure that this program did not disappear when we went through divestiture. He has made a significant contribution to the success of more than 50 different students. He actually goes to the end of the world to make sure that students get the right kind of mentoring and support that is needed so that they succeed. His work was recently recognized with an award from the President of the United States, The 1997 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. We hold the highest regard for Charles for all that he has done with our program and the mentoring he has done to the mentors in our program. So with that we decided to name this award the 1998 Charles Thompson Mentoring Award.

***Dr. Louise Brown, AT&T Labs,  
Presenter to Dr. Ted Eckberg***

Dr. Ted Eckberg has been my ALFP mentor for the past four years. He has served on both the Proposal and Defense Committees, and has played as important a role as my advisors in the completion of my doctoral degree. Words can not adequately express my gratitude and appreciation for the opportunity to be mentored by Dr. Eckberg. Dr. Eckberg has been actively involved throughout the entire process of my doctoral studies. When my advisors and I faced a seemingly insurmountable hurdle in the final quarter of my graduate studies it was Dr. Eckberg who was able to suggest

an alternative path. His suggestion enabled me to save the work I had already done and complete my dissertation in a timely fashion. When my work required extremely fast computational resources which were unavailable at Georgia Tech, it was Dr. Eckberg who personally designed a secure system whereby I could conduct my simulation experiments on AT&T computers here in New Jersey from Atlanta, Georgia.

Dr. Eckberg has been tireless in his efforts to insure that I completed the ALFP process successfully. He provided reference material from his personnel library; reviewing my course work and staying in constant contact with my advisors throughout my doctoral studies are examples of his determination and concern that I would never stray from my goal.

Dr. Eckberg has spent a tremendous amount of time and energy, much of it personal, mentoring me during my graduate studies. He has been my guide, my inspiration, my friend and my advisor. He was kind to me when I needed kindness, and firm when it was required, and it was required pretty often. There was always the indefinable comfort of knowing that he was always present, willing to listen, and to advise. Dr. Eckberg was also instrumental in circulating my resume within AT&T, subsequently setting up my interviews and was my host during my interview process with the company. I am now a full-time employee at AT&T and that decision was based in great part in my relationship with Dr. Eckberg.

My goal is one day to become an ALFP mentor myself. I aspire to be as excellent a mentor as Dr. Eckberg has been to me. In closing let me say that Dr. Eckberg embodies all that ALFP mentors should be. Without him I would have been unable to complete my work.

Ladies and gentlemen I should like to present to you my mentor Dr. Ted Eckberg.



***Ted Eckberg, AT&T Labs***

I was told by Pat that I could take a one or two-minutes to say a few words. I wanted to convey my own feelings when it was made known to me, I guess it was last week, that I had won this award. It was really a complete shock. I didn't know anything about this. My first reaction was "what is it that really distinguished me from any of the other mentors." And I am not sure if I really have a good answer to that and I think that actually everyone of the mentors in the program deserve this award as much as I do. On the other hand I will take the award.

So, I am still a little bit in shock but I am really honored by the fact that the award is named after Dr. Charles Thompson because by being affiliated with this program and being a mentor it has given me the opportunity to interact a lot with him too. I think that the subtle ways that he comes in and influences what is going on in the program is really astounding. He is really to be commended. There are a lot of other people who I think should be thanked for the fact that I have received this. First of all is Louise because a mentor cannot be a mentor without a mentee and we have had a mentoring relationship for quite awhile and I think that she has really helped me become a reasonably good and effective and contributing mentor. So thank you Louise. I would also like to thank Pat Wirth and her whole department. Pat really sets up a very supportive environment for these types of activities. For those of you who don't know

the other members of Pat's department, some of them are here, let me just say that it wasn't just me that Louise had the opportunity to interact with but it was all the other members of the department. They provided a very rich experience for Louise. So I want to thank them. I'd like to thank my family because they always support me in what I do.

I got here late because I was stuck at the monastery in the morning. That's a joke. In taking part in the program this afternoon, I began thinking about who are effective individuals as mentors. I began thinking of some of the people that affected me as a mentors. Even though I cannot mention the names because no one here would know them, I'm going to thank them. They probably helped put me on the track to be able to convey some of this to someone like Louise. I wish you all the best Louise.

***Dr. Sandy Frazier, VP, AT&T Labs,  
Presenter to Dr. David Johnson***

Congratulations Ted. I have the honor of introducing to you the second recipient of the 1998 Charles Thompson Outstanding Mentor Award, David Johnson. David Johnson was nominated by a mentee who is not able to be here today. I would like to read from the letter that she wrote which refers to her participation in the GRPW program between 1989 and 1996. From that letter she wrote, "I worked with David during the summers of '89 through '90 on a research problem in Graph Theory known as the Traveling Salesman Problem, which today is well known. David gave me the ideal project to work on, it was challenging and interesting, and yet it was accessible even to a beginning graduate student. I'd had some prior research experience but this was by far the most enjoyable and satisfying research experience up to that point. It really whet my appetite for my graduate studies and thesis work. David gave me an excellent technical guidance while also giving me the time and space to work

independently. He also included me in the daily lunches with other research computer scientist and mathematicians. I believe that that helped prepare me for the social and technical interaction which are so important in a professional career.”

There is a paragraph in which she explains that there was a time during graduate school when she turned to David for advice on a rather difficult matter that could have impacted her career and was really rather hard for her to handle. David supported her during that critical time and that support was very important for her.

The letter ends with “With thanks to David, the GRPW program did for me what it aims to do for all of its participants. It gave me a positive research experience that pointed the way for my own research and it provided the emotional and technical support that helped me succeed in the face of adversity.”

They continue to keep in touch, I understand, even after graduation and she still attends the annual picnic in order to catch up with him and with other people in the Lab. My experience with student programs generally bears out the remarks that were made earlier. That is the association that students have with scientists during their participation in these activities goes a long way (unknowingly on the part of the scientist) to help and guide and inspire. I am sure just these lunches and by being included in these lunches, that was the important part of the thing.

David has been involved in the GRPW program for a long time, for about twenty years. He served on the Selection Committee for the last five years, I believe he also helped to organize this symposium. He mentored four GRPW students, one received a Ph.D. in Mathematics from MIT, the second a Ph.D. in Computer Science from Berkley and is now a faculty member, a professor, another has a Ph.D. in Mathematics at Rutgers and is currently a Assistant Professor, the fourth has an M.S. in Computer Science at Berkley. I am told she is the fourth ranked aerobatics pilot in

the United States. David’s involvement continues. He will be mentoring another student who’s beginning the mentor process, a fifth GRPW student this summer. Therefore it is with great pleasure that I ask David to accept the 1998 Charles Thompson Outstanding Mentor Award.



***David Johnson, AT&T Labs***

I’d like to say a few words. I must admit that when I learned that I was getting this award I think I was more pleased that Gretchen had written me a nomination than I was of actually getting the award. The satisfaction in knowing that what you’ve done made an impact and it is appreciated is much more than any award can be. It’s not an award I feel I have done enough to deserve. I certainly have learned a lot more listening to the people talk here today about how I can do a better job in the future. I look forward to my new experiences that are going to be started this summer. Thank you!

***Hrair Aldermeshain, AT&T Labs***

With that let me say thank you to all for coming. I think it was an exciting program for me. I learned a lot and my hope is that we will not end it here tonight but rather form the relationships and linkages that we talked about during these sessions. Thank you again.

## Symposium Speakers

**David C. Nagel** is the first President of AT&T Labs as well as AT&T Chief Technology Officer. Nagel advises the AT&T Operations Team and Chairman's Office on technology issues, and chairs the Technology Strategy and Development Council. Prior to joining AT&T, he was a senior vice president of Apple Computer. Before that Nagel was a research scientist and head of human factors research at NASA's Ames Research Center. Dr. Nagel has served on the National Critical Technologies Panel and National Research Council Study Symposium. He is a member of the National Academy of Sciences Committee on Human Factors and, in February 1997, he was named to President Clinton's first Advisory Committee on High Performance Computing, Communication and the Next Generation Internet. He serves on the Boards of Directors of the Tech Museum of Innovation in San Jose, California, and the Kyle Foundation and is a Member of the Board of Trustees of the UCLA Foundation. He holds undergraduate and graduate degrees in engineering and a doctorate in experimental psychology, all from the University of California, Los Angeles.

### *Technical Leadership for the 12th Century: Challenges and Goals*

**C. Michael Armstrong** was named chairman and chief executive officer of AT&T effective November 1, 1997. At AT&T, he heads the world's leading communications services company, with more than 90 million customers, 130,000 employees and \$52 billion in revenues. Armstrong came to AT&T from Hughes Electronics, where he had been Chairman and CEO for six years, transforming it from a company focused mainly on defense to a powerful competitor in the commercial electronics, space and telecommunications industries. Prior to Hughes, he spent 31 years at IBM where he rose through the ranks from systems engineer to become senior vice president and chairman of the board of IBM World Trade Corporation. Earlier he played major roles in IBM's personal computer and

telecommunications businesses. Armstrong earned a B.S. degree in business and economics from Miami University of Ohio in 1961 and completed the advanced management curriculum at Dartmouth Institute in 1976. Mr. Armstrong serves as chairman of the President's Export Council, the premier national advisory committee to President Clinton and the Secretary of Commerce on matters related to exports and international trade. He is a member of the Council on Foreign Relations, the National Security Telecommunications Advisory Committee and the Defense Policy Advisory Committee on Trade. An active support of higher education, Armstrong is a trustee of Johns Hopkins University and a member of the advisory board of the Yale School of Management.

**William M. Bulger** became the twenty-fourth president of the University of Massachusetts following a 35-year career as a leading Massachusetts state lawmaker including serving as president of the Massachusetts Senate for 22 years. He has played pivotal leadership roles on issues that shaped the physical, cultural and social landscape of Massachusetts. He was one of the architects of a groundbreaking education reform law that reduced the funding inequities between rich and poor communities. He was among the first advocates of charter schools and public school choice. He made funding of public libraries a top priority and also advocated for the expansion of childhood nutrition services and fuel assistance programs. Mr. Bulger is a past president of the Boston Public Library Board of Trustees and continues to serve on the Board. He is also a member of the Boston Symphony Orchestra Board of Overseers, Massachusetts General Hospital Board of Trustees, the Citizens Bank of Massachusetts Board of Directors and New England Electrical System Board of Directors. He is the recipient of more than 20 honorary degrees from institutions of higher learning.

**Richard T. Roca** is Vice-President, AT&T Applied Technologies, AT&T Labs and Chief Technical Officer of AT&T Solutions. He is responsible for maintaining AT&T's strength in key technologies and for ensuring that these technologies are effectively applied to the needs of AT&T's customers. Prior to this, he was the Civilian Markets Vice-President for AT&T Government Markets where he was the

general manager responsible for all facets of AT&T's communications services for civilian agencies of the U.S. Federal Government. Dr. Roca joined Bell Laboratories after receiving a B.S. degree in engineering from Lehigh University. He attended M.I.T. under Bell Labs sponsorship, where he received both S.M. and Sc.D. degrees in 1967 and 1972. At Bell Laboratories, Mr. Roca held a number of senior executive positions, where he planned, developed, and implemented communications products and services for AT&T's commercial and government customers. In 1977 he was awarded a Congressional Fellowship and worked on the National Energy Act with the U.S. House of Representatives Commerce Committee. He is an ASME Fellow, a past Vice-President of the ASME Board on Engineering Education, a senior member of IEEE, and a former member of the ABET Board of Directors. He is currently chairman of the Council of Advisors to the School of Engineering, Lehigh University, and a member of the Board of Trustees, National Technological University.

**Mozelle W. Thompson** is a Commissioner on the Federal Trade Commission, the agency that enforces federal laws and rules prohibiting unfair or deceptive practices or methods of competition. Previously, as Principal Deputy Assistant Secretary of the Treasury, he oversaw domestic spending and credit policies, including the operations of the Federal Financing Bank and the Office of Government Financing. He was responsible for creating the Office of Privatization which provides guidance on the privatization of federal assets and operations. Before joining Treasury, he served as Senior Vice President and General Counsel to the New York State Finance Agency and its four sister corporations. He has served as an adjunct associate professor at the Fordham University School of Law and was an attorney with the New York firm of Skadden, Arps, Slate, Meagher and Flom. Mr. Thompson is active in the Association of Black Princeton Alumni and on the Executive Board of Practicing Attorneys for Law Students, a mentoring organization assisting African-American and Latino law students.

**William A. Wulf** is president of the National Academy of Engineering and vice chair of the National Research Council, the principal operating arm of the National Academies of

Sciences and Engineering. He is on leave from the University of Virginia, Charlottesville, where he is AT&T Professor of Engineering and Applied Sciences. Among his activities at the University has been a complete revision of the undergraduate computer science curriculum research on computer architecture and computer security, and an effort to assist humanities scholars to exploit information technology. Mr. Wulf has served as the assistant director of the National Science Foundation; chair and chief executive officer of Tartan Laboratories, Inc.; and professor of computer science at Carnegie Mellon University. He is the author of more than 80 papers and technical reports, has written three books, and holds one United States patent.

### ***Building Effective Mentoring Relationships***

**David A. Berkley** holds a B.E.E. (1960) and a Ph.D. (1966) degree in applied physics from Cornell University in Ithaca, New York. He joined AT&T Bell Laboratories in 1968, first working in the Mechanics Research Department and moving to Acoustics Research as a supervisor in 1975. Dr. Berkley became head of that department in 1990. In 1995 he spent about 6 months in AT&T Business Communications Services on a rotational assignment as Division Manager, Global Services, Enhanced Voice Product Management. In early 1996 he joined AT&T Labs --Research in his current position as Head of the Speech Processing Software and Technology Research department.

**Albert G. Greenberg** is the Head of the Network Mathematics Research Dept. at AT&T Labs - Research. He received a BA in Mathematics from Dartmouth College in 1978, a Ph.D. in Computer Science from University of Washington in 1983, and joined AT&T Bell Laboratories in 1983. He is interested in measurement, modeling, and building networks and distributed systems.

**William A. Massey** received the AB degree in 1977 from Princeton University in Mathematics (Magna cum Laude, Phi Beta Kappa, and Sigma Xi) and was awarded a Bell

Labs Cooperative Research Fellowship to attend graduate school at Stanford University. In 1981, he received his Ph.D. degree from Stanford in mathematics. Since 1981, he has been a member of technical staff in the Mathematical Sciences Research Center at Bell Laboratories. He has written papers on non-stationary queues, stochastic ordering, queueing networks, database theory, and wireless communications. His research interests include queueing theory, applied probability, and performance modeling of telecommunication systems.

**Anthony M. Johnson** is Chairperson and Distinguished Professor of Physics at New Jersey Institute of Technology in Newark, NJ, where he is. He is also Chairperson of the Federated Physics Department, joint between NJIT and Rutgers University (Newark Campus). He received his Ph.D. in Physics from City College of the City University of New York and B.S (Magna Cum Laude) from Polytechnic University. He was a recipient of the AT&T Bell Labs Cooperative Research Fellowship He is a Fellow recipient of the 1996 Edward A. Bouchet Award of the American Physical Society, a Fellow of the American Association for the Advancement of Science and the Optical Society of America. His general area of research is in ultrafast optical and optoelectronic phenomena and has 60 refereed publications, 2 book chapters, and 4 US patents in this area. His current research interests include the ultrafast photophysics and nonlinear optical properties of bulk, nanoclustered, and quantum-well semiconductor structures, ultrashort pulse propagation in fibers and high-speed lightwave systems. Dr. Johnson serves in a leadership capacity as editor and chairperson on numerous national and international journals and committees.

**James McKenna**, biography not available.

**Arlie O. Petters**, Director of Graduate Studies in the Department of Mathematics at Princeton University, obtained his B.A/M.A. from Hunter College-CUNY in 1986 and his Ph.D. in Mathematics from MIT in 1991. He became an Assistant Professor in the Department of Mathematics at Princeton University in 1993. He has been a visiting mathematician at the Geometry Center at the University of Minnesota, the Mathematical Institute at

Oxford University, and the Max-Planck-Institut für Astrophysik. Dr. Petters has received a number of awards, including the Minority Access to Research Careers Fellowship, the Gillet Alumni Prize in Physics, the Joseph A. Gillet Memorial Prize in Physics, the Rainer Sachs Scholarship in Math, the Harold Hoey, Jr. Scholarship in Math, the Bell Labs Cooperative Research Fellowship, Sigma Xi, the Belizeans in Solidarity Award for Outstanding Academic Achievement, and the Alfred P. Sloan Research Fellowship (1998-2000). His research interest is in Mathematical Physics: Gravitational Lensing, and related areas (Singularity Theory, General Relativity, Theoretical Astrophysics).

**Jennifer Rexford** received a B.S. degree in electrical engineering from Princeton University in 1991, and MS and Ph.D. degrees in computer science and engineering from the University of Michigan in Ann Arbor, in 1993 and 1996, respectively. She was a participant in AT&T Bell Labs' undergraduate research program in the summer of 1990, and the Graduate Research Program for Women from 1991-1996. Since 1996, Jennifer has been a member of the technical staff in the Networking and Distributed Systems center at AT&T Labs - Research in Florham Park, New Jersey. Her research interests include routing and signaling protocols, video streaming, and packet scheduling, with an emphasis on efficient support for quality-of-service guarantees.

**Carl Spight** has been the Manager of Academic Services at the Office of Information Technology of the City Colleges of Chicago since 1994. Carl got his B.S.E.E. (with highest Honors) from Purdue in 1966, his M.A. from Princeton in 1971, and his Ph.D. in Plasma Physics from Princeton in 1971. He was Professor and Chairman of the Department of Physics at Morehouse College, Atlanta, from 1972 to 1980, Vice President of Research, AMAF Corporate Research Group, Chief of Advanced Technology Programs and Director of Engineering and Chief Scientist at Sonicraft, and Executive Assistant to the President of Clark Atlanta University. His awards include Eta Kappa Nu (Electrical Engineering), past President, Purdue University; Tau Beta Pi; Sigma Pi Sigma; Beta Kappa Chi; Outstanding Educators of America, 1974 Outstanding Young Men of America; Distinguished Service

Citation of the American Association of Physics Teachers; "Outstanding Contributions to Black Critical Thought"--Black Studies Conference Committee, African American Studies Association -Annual Black Studies Conference; William F. Thornton Professional Achievement Award, National Technical Association; Distinguished Alumni Award, Association of Black Princeton Alumni. Dr. Spight has an extensive list of publications, both technical and non-technical.

**Charles Thompson** is Professor of Electrical Engineering, Co-director, Center for Advanced Computation and Telecommunications and formerly Associate to the Dean for Research and Graduate Study at the University of Massachusetts at Lowell. He received a B.S. from New York University, a M.S. at the Polytechnic University in Electrical Engineering, and a Ph.D. in Acoustics at MIT. He was Assistant Professor of Engineering Science and Mechanics at Virginia Polytechnic Institute and State University from 1982 to 1986. Dr. Thompson served on the executive board of the Cooperative Research Fellowship program of AT&T Bell Laboratories (1991-1996), on the executive board of the Cooperative Research Fellowship Program of Lucent Technologies (1996-present), and on the executive board of the AT&T Labs Fellowship Program (1996-present). His awards include the Presidential Award for Excellence in Mentoring; Tau Beta Pi Eminent Engineer; Who's Who in Education; Who's Who in Science and Engineering; James E. Blackwell Scholar; American Men and Women of Science; Sigma Xi; Who's Who in Technology Today; Outstanding Young Men in America Award; AT&T Bell Laboratories Cooperative Research Fellow. He has published on acoustics, computational engineering, control theory, fluid mechanics, heat transfer, linear and nonlinear systems, perturbation methods, and telecommunications.

**Carlton M. Truesdale**, is a senior research scientist for Corning Glass Works. He received his B.S. from Morehouse College in 1976 and his Ph.D. from U.C. Berkley in 1981. Both degrees are in Chemistry. He has published numerous articles in the area of optical physics. His awards include National Society of Black Engineers Outstanding Scientist Award, Phi Beta Kappa; Sigma Xi; Who's Who in the East;

AT&T Bell Laboratories Cooperative Research Fellowship.

### ***Mentoring - A Strategy for Success***

**Mirian M. Graddick** is Vice President - Human Resources, Business Effectiveness for AT&T. She is responsible for Executive Human Resources, Education and Training, Performance Management and HR Governance. She also supports the HR Leaders in the Local Entry and the Consumer and Small Business Operating Units. Previously, she was Vice President - Executive Human Resources and Multimedia Products Group. Prior to that, Dr. Graddick supported five Customer Service Centers located in the eastern United States. She joined the company in 1981 and held a variety of assignments including human resource planning, management of executive education programs, the development of corporate-wide high potential programs and succession planning. Dr. Graddick's research has concentrated on the analysis of managerial jobs, correlation of the advancement of women into middle and upper management, the selection and development of U.S. expatriates, integrating business planning and human resource planning and corporate philosophies of management development. She received her B.A. degree in Psychology from Hampton University and her M.S. and Ph.D. from Penn State in Industrial/Organizational Psychology. She is a member of the American Psychological Association and the Society of Industrial/Organizational Psychologists Division. In 1990, Dr. Graddick was the recipient of the AT&T's Catherine B. Cleary Management Award. She serves on the Board of National Medical Fellowships, Inc.

### ***The University Perspective - Mentoring Partnerships***

**Howard G. Adams** holds a B.S. from Norfolk State University, a M.S. from Virginia State University, and a Ph. D. from Syracuse University. He began his career in education as a teacher of science and biology in the Norfolk, Virginia school system, after which he served as Vice President of Student Affairs at Norfolk State. From 1978 to 1995 he was the Executive

Director of the National Consortium for Graduate Degrees for Minorities in Engineering and Sciences (GEM), and he is currently the Director of the GEM National Institute on Mentoring. He has been a consultant in the areas of college relations, diversity programs, and campus recruiting for companies ranging from Apple Computer to Union Carbide. Under the sponsorship of such organizations as the National Science Foundation, W.K. Kellogg, and the Sloan Foundation he has developed, authored, and published a wide variety of material on mentoring and success in graduate school, including *Mentoring: An Essential Factor in the Doctoral Process for Minority Students*" (1992).

**Wesley L. Harris** received his B.S. degree in Aerospace Engineering from the University of Virginia in 1964, and M.A and Ph.D. degrees in Aerospace and Mechanical Sciences from Princeton in 1966 and 1968. He is currently a Full Professor of Aeronautics and Astronautics at the Massachusetts Institute of Technology, having previously served in technical and administrative positions both at M.I.T. and other institutions, including NASA, the University of Tennessee Space Institute, and the Universities of Connecticut and Virginia. He has served as chair and member of various boards and committees of the National Research Council, the National Science Foundation, the U.S. Army Science Board, and several state governments, and has an outstanding record in advancing cultural diversity in academe and in government. He is a Fellow of the American Institute of Aeronautics and Astronautics and of the American Helicopter Society, and is a member of the National Academy of Engineering.

**Sheila M. Humphreys** is a graduate of Smith College and received M.S. and Ph.D. degrees from Tufts University. She has been working in intervention programs to increase the participation of underrepresented students in science and engineering since 1975. She is currently Academic Coordinator for Student Programs in the Department of Electrical Engineering and Computer Sciences, College of Engineering, University of California Berkeley. She co-founded the Computer Science Reentry Program, UC Berkeley. Her previous positions include Associate Director, Center for the Study and Advancement of

Women, UC Berkeley, and Assistant Dean of Admissions, Mills College. She currently serves on the Berkeley Graduate Division Graduate Affirmative Action Committee, the Computer Research Association's Nico Habermann Award Committee, and on the MentorNet Advisory Board. She is Editor of "Women and Minorities in Science" (Westview Press, 1982), Co-Editor of "Evaluation Counts: A Guide to Evaluating Math and Science Programs for Women" (Columbia, 1984), and author of many articles on women in science.

**William Yslas Velez** was born and grew up in the Spanish-speaking part of Tucson, Arizona. He received Bachelor's, Master's, and Ph.D. degrees from the University of Arizona, the last in 1975 and all in mathematics. For the next two years he served as a member of technical staff at Sandia Laboratories in Albuquerque, and since then he has been on the faculty at the University of Arizona, where he has been a Full Professor of Mathematics since 1989, and has been awarded outstanding teaching and advising awards. He was a program director for Algebra and Number Theory at the National Science Foundation during 1992-93, and in 1993 was awarded the NSF Director's Equal Opportunity Achievement Award. He currently is the director of NSF-funded Southwest Regional Institute in Mathematical Sciences. He is the Founding Member of the Society for the Advancement of Chicanos and Native Americans in Science and currently is its President.

### ***The Government Perspective - Encouraging Mentoring***

**Wanda E. Ward** is Assistant to the Deputy Director for Human Resource Development at the National Science Foundation. She assists the Deputy Director with program integration and human resource development, diversity, and equal opportunity. She provides oversight to NSF's Office of Equal Opportunity Programs and serves as Executive Liaison to the Committee on Equal Opportunities in Science and Engineering. Previously, Dr. Ward was Senior Staff Associate for Policy and Planning for the Directorate for Education and Human

Resources where she played a key role in the interagency planning, development and implementation of the Presidential Awards for Excellence in Science, Mathematics, Engineering Mentoring Programs, established by the White House Office of Science and Technology Policy. Before joining NSF in 1992, Dr. Ward was an Associate Professor of Psychology and Founding Director of the Center for Research on Multi-Ethnic Education at the University of Oklahoma, Norman. She has held positions at the University of Illinois at Urbana-Champaign and Johns Hopkins University. She received her B.A. from Princeton University and Ph.D. from Stanford University.

### ***Partnerships to Increase Representation***

**Hrair Aldermeshian** is Advanced Technologies Vice President in the Applied Technologies Organization of AT&T Labs. He is currently responsible for traffic and performance analysis of voice and data communications networks, operations research, applications and networking technologies and standards, and enterprise network management software platform development for the AT&T Solutions Outsourcing Global Customer Support Center(s). He joined AT&T Bell Laboratories in 1975 and worked on private network service planning, administration, transmission, and traffic engineering. Since then he has had a variety of leadership positions including responsibility for Integrated Services Digital Network architecture and planning, and national and international standards representation and coordination; next-generation network evolution planning with local exchange carriers; technology assessment and definition, prototyping, and trialing of applications such as video communications, information services, and wireless technologies; and global strategy planning, competitive assessment, market assessment, and network planning for AT&T Network Systems. Between 1993 and 1995, he was responsible for architectural specifications of new service concepts and applications layer in the Architecture Area of Bell Laboratories. Dr. Aldermeshian received his Bachelor of

Science degree in electrical engineering from the American University of Beirut, and Master's and Ph.D. degrees in electrical engineering from the University of Pittsburgh.

**Janice E. Cuny** has worked in the area of parallel programming environments for more than a dozen years; her research interests include parallel program specification, compilation, debugging, steering, and visualization. She is currently collaborating with geological scientists to build a domain-specific environment for seismic tomography and fast prototyping environments for model coupling. She has been a member of the Computer Science Departments at Purdue University and the University of Massachusetts; she is now at the Department of Computer and Information Science at the University of Oregon. Dr. Cuny has been a member of the Computing Research Association's Subcommittee on the Status of Women in CS&E (CRA-W) since 1994. For several years, she ran their very successful faculty mentoring workshops. She has participated in their distributed mentoring project for a number of years, hosting a total of five undergraduate women in her lab for summer research projects. Since 1996, she has been a co-chair of CRA-W.

**Carol B. Muller** is the founder and executive director of MentorNet, the national electronic mentoring network for women in engineering and science, a program of WEPAN, the Women in Engineering Programs & Advocates Network, based at San Jose State University. She is also the executive director for the Dartmouth Project for Teaching Engineering Problem Solving at Dartmouth College, an NSF-sponsored program designed to bring engineering problem solving techniques to high school science and math teachers. She is a consultant to Stanford University in designing and implementing a series of engineering faculty development workshops. Her 21 years of experience in higher education includes academic administration, strategic planning and budget development facilities program planning and development. As associate dean for Dartmouth's school of engineering in the 1990s, she co-founded the award-winning Women in Science Project. She graduated from Dartmouth College and has a Masters and Ph.D. degree from Stanford University in education administration and policy analysis.

**Marilyn Reznick**, Vice President of Education Programs at the AT&T Foundation, directs AT&T's philanthropy in education and coordinates this work with the company's interests in integrating technology in education. She directs the AT&T Foundation's grants program for the AT&T Learning Network, the company's five-year commitment to bring information technology and support services to every elementary and secondary school in America. In her 15 year career with AT&T, Marilyn has directed corporate public relations programs in New Jersey, New York and New England, providing media relations, marketing and communications support to multiple business units. Previously, Ms. Reznick was Director of Admissions and Instructional Development Specialist at Southern Illinois University School of Medicine in Springfield, Illinois. Her educational experience also includes assignments as Director of Alumni Affairs at the University of Hartford in Connecticut, and Development Officer at Kendall College in Evanston, Illinois. She holds a master of arts degree in history from the University of Illinois at Springfield and a bachelor of fine arts degree in theater and voice from the University of Kansas.

**William A. Sibley** is the Program Director of the Centers for Research Excellence in Science and Technology (CREST) of the National Science Foundation. Dr. Sibley has also served as the Vice Chancellor for Academic Affairs at the University of Alabama at Birmingham, Acting Director of the Division of Materials Research at NSF, and Program Director for the Experimental Program to Stimulate Competitive Research (EPSCoR), also at NSF. Prior to joining NSF he served as Head of the Non-Metals Section at Oak Ridge National Laboratories, followed by 18 years at Oklahoma State University as Head of the Physics Department, Director of the School of Physical Sciences, and finally as Vice President for Research. Dr. Sibley has received the Outstanding Teacher Award at Oklahoma State University, The Sigma Xi Research Award at Oklahoma State University, and the President's Medal for Service at the University of Alabama at Birmingham.

**L. Nan Snow** has served as Executive Director of the National Physical Science Consortium

since its inception in 1987. Prior to that she served as technical training Manager at the Lawrence Livermore National Laboratory for twelve years, with expertise and special knowledge in the areas of program development, recruiting, counseling students, apprenticeship training, and continuing education for scientists and engineers. She has served on local, state and national education advising committees and lectured at numerous professional seminars, as well as having served as Chairman of the California Joint Apprenticeship Committee for Single Plant Industries for 5 years. She was appointed by the Governor and served as Commissioner, California Apprenticeship Council 1982 - 1985. Serves as a member of the Board of Directors for the CRCM projects at Clark Atlanta, Atlanta, Georgia; University of Texas, El Paso, Texas.

### ***Opportunities Creating Tomorrow's Scientific/Engineering Leaders***

**Patricia E. Wirth** is currently Functional Director, Teletraffic and Performance Analysis Department, AT&T Labs, providing performance modeling and analysis support to a wide variety of AT&T's products and services. In 1981 she joined AT&T Bell Laboratories where she was a Member of Technical Staff until 1985 when she became a Technical Manager supervising performance modeling of AT&T's 5ESS Switch. In 1990 she was appointed Head of the Department of Teletraffic Theory and System Performance. She has been a member of the AT&T Labs Fellowship Program Committee (and its predecessor the Cooperative Research Fellowship Program Committee) since 1991. She was the co-chair of the Technical Program Committee for the 15th International Teletraffic Congress. She has received the YWCA Tribute to Women and Industry Award, the Women of AT&T Management Executive Award and in 1997 she was named an AT&T Fellow, the highest technical award given in AT&T. She received a B.A. in Mathematics from the University of Nebraska in Lincoln in 1971 and the M. S. and D. Sc. degrees in Systems Science and Mathematics from Washington University in St. Louis in 1978 and 1980.

### ***Keynote Speech***

**Robert L. Mallett** is Chief Operating Officer for the Department of Commerce and is responsible for managing the day to day operations of the \$4 billion, 33,000 employee federal agency, as well as providing leadership and direction for the diverse bureaus of the department operating in an ever changing global economy. Deputy Secretary Mallett assumed his new assignment with a broad background in government operations and agency management, having served from 1991 through 1995 as the City Administrator for the District of Columbia with primary operations and management responsibility for a municipal government with 40,000 employees and a \$3.5 billion budget. Deputy Secretary Mallett was graduated magna cum laude from Morehouse College in 1979 where he was a member of Phi Beta Kappa. Mr. Mallett was graduated from Harvard Law School in 1982 where he served as project editor of the Harvard Civil Rights-Civil Liberties Law Review. Upon graduation from law school, Mr. Mallett clerked for the late Honorable John R. Brown, United States Court of Appeals for the Fifth Circuit. From 1983-1987 Mr. Mallett practiced law as an associate attorney at Kaye, Scholer, Fierman, Hayes & Handler, and subsequently as Legal Counsel to the Honorable Lloyd Bentsen, United States Senator, from 1987-1991. He began municipal government service in 1991 as Principal Deputy Corporation Counsel, Office of the Corporation Counsel, for the District of Columbia. Later that year, Mayor Sharon Pratt Kelly elevated him to the position of City Administrator. Mr. Mallett returned to the private sector in 1995 as a shareholder with the law firm of Verner, Liipfert, Bernhard, McPherson & Hand, working in the firm's Legislative and Energy and Environmental Practice groups. He later became Director of Marketing for the 1997 Presidential Inaugural Committee. Deputy Secretary Mallett is involved in many civic activities and serves on several boards, including the National kidney Foundation of the National Capital Area and the Wesley Theological Seminary. He is a member of Asbury United Methodist Church, where he also serves as an usher and chairman of its Board of Trustees. He has served as an adjunct professor of law at Georgetown Law Center and the Georgetown Graduate Public Policy Program. Deputy Secretary Mallett resides in Washington, D.C. with his wife,

Attorney Terri (nee) Thompson, and son Michael.