

## **“Thrive – not just survive!”**

Honorable Finance Minister, Shri Pranab Mukherjee, Professor M.G.K. Menon, President of the Indian Statistical Institute, Director Bimal Roy, Dean B. P. Sinha, members of the faculty and staff, distinguished guests, students, graduates, and their families.

It is a great honor, and a pleasure, to be here in this beautiful mango grove, that is full of sweet memories.

I want to thank, the Director, for inviting me, to the 45th convocation of ISI. It is great to be back, to see some of my teachers and friends, after over thirty years.

Our proud graduates- my hearty congratulations to you, and to everyone who stood beside you, to see you reach your full potential- your proud family members, faculty and staff at ISI, your friends, and your inner voice.

Congratulations to all of you! You should be proud of yourself.

A bright future is ahead of you. I know you will go into the world, and make a change!

Before I address the graduates, let me take this opportunity to, thank Honorable Finance Minister, Shri Pranab Mukherjee, for his vision, and for his support, to the Indian Statistical Institute in Kolkata, and for its expansion, throughout India.

His investment in Statistics, a field that is, a key to innovation in a data-centric world, will have a long term impact on science, and quality of research, in India and globally. I look forward to its expansion, globally.

Thank you Honorable Minister! **[lead the claps if he is there]**

This is truly an exciting time to be a statistician, and I can spend alllllll my time in my address, talking about the impact statisticians are having on new discoveries.

Or, give a scientific talk, on nonstationary time series models, like I did yesterday.

Today, however, I chose to focus on three items: [count the numbers with fingers]

Number 1. Friends are very Important, Hang on to Them!;

Number 2. I will say a few words, about some Future Trends in Statistics; and

Finally, Number 3. I will close with, Some Friendly Advice for the graduates.

Like some of the delegates on this stage, I have listened to many convocation addresses in my life, and remember only a few of them.

One speech that I do remember well, is an address given by Professor John Rawlings, at North Carolina State University in 1995. With his permission, I borrow some of his words, in my address today.

### **Friends are Important, Hang on to Them!**

I am very fortunate, to have made great friends in my life, especially here on this ISI compound.

Friends are there, in your good times and **bad** times.

They are there when you need them, even if you didn't realize that, you needed them.

All of my successes are, completely due to my friends and my family.

ISI is an excellent place, where you can build relationships, and help each other network, for the future.

When I arrived at ISI in 1974, I was barely 17.

First week at ISI was interesting. I was asked to go find Cook Rao, to find my room in the hostels, and I instead, knocked on the door of the Director C.R. Rao's flat on campus!

He was kind to me then, and continues to support me in many ways now. I am sorry that he couldn't join us today.

At the beginning at ISI, I was so homesick, I wanted to go back to my home and family in Vizianagaram. *Bangla bhujte or bolte parlam na!*

One of my seniors, Professor C. N. Rao, now at Old Dominion University, yelled at me and said "How crazy can you be for thinking about leaving? You are one of the top 25 students, selected from all over India, to get the best education, for free."

I am glad I stayed at ISI, and developed a support group, I could count on.

I found out later, that had I gone back, my father, a middle class math teacher, who taught me calculus every morning, did not have the money, to support another of his sons, to go to an engineering college.

Professor C.N. Rao, later paid my application fee, to some of the schools I applied in USA.

We have been very good friends since our ISI days. I cherish that!

Friends don't have to be *just* your classmates.

They can be your seniors, your juniors, or even your faculty, or staff at ISI.

For example, Professor T.J. Rao, and our class teacher Professor J. Roy, took great care of us, while I was here.

Professor Malay Ghosh, who taught me while I was at ISI, took me into his home, when I moved to Iowa State University for my Ph.D.

Professor Ghosh and, my advisor, Professor Wayne Fuller, are very good friends of mine now.

Here are the folks who helped me, only when I needed it, and cheered me on every occasion, they had a chance for.

At North Carolina State, I have many friends, especially ISI alumni, like Professors Bibhuti Bhattacharyya, Sujit Ghosh, Subhashis Ghosal and Arnab Maity.

Also, locally, another ISI alumna, Dr. Indrani Nandi has been very successful at GlaxoSmithKline, and has been a good supporter of our graduate program at NC State.

Several of my best friends, are also staff members, who help me everyday, to be successful.

Your secretary, the safety guard at the gate, the mailman,...., please don't forget, to share a smile with them, and make friends.

Believe me, they help you in many ways, and make your life easier.

Respect every one! You must give, in order to receive.

When I moved recently to Washington DC, our ISI alumni friends, like Professors Tapan Nayak and Neerchal Nagaraj, have been very helpful.

Both have been department chairs of statistics, and are very successful.

Another ISI alumnus, the founder of a successful company called, TEOCO, Atul Jain, went out of his way, to buy a nice place for us to rent.

He works with, a number of our ISI alumni, like Anil Mathur, Srinivas Bhogle and Shubha Dey, among many others, who take the ownership, to make TEOCO a great success.

Many of my ISI buddies, like Professors N. Mahadev, Indrani and Prasanta Basak, and other successful alumni, like N. Prasad and S. Amarnath, we

get together regularly at the Jain Mahal, to share our ISI stories, and make up a few, just to add some masala to them.

Also, a National Academy Professor of Economics in Mexico, Tapen Sinha, is very helpful to me.

We call him e-garu fondly, since he can dig up any information we need, *instantly!*

Finally, the Director of Chennai Math Institute, Professor Rajeeva Karandikar, helped me stay sharp, with his yearly visits to North Carolina.

If a man is known by the company he keeps, I am certainly the luckiest man in the whole world, and I am thankful to ISI for that.

I am very grateful to my family and friends. They are my key supporters, and my cheer leaders.

Bonds we develop at Amropali, are strong and unbreakable.

Friends of your friends, are more likely to be helpful to you, than friends themselves.

So, the network expands, and you would end up, with a strong web of friends.

Without such support, I could not have been elected, the 2010 President of the American Statistical Association, which has 18,000 members around the globe.

I am now building a new circle of friends, in statistical, mathematical and computational sciences, at the National Science Foundation in USA.

I have a great job, and get to see the highest quality research, in statistical mathematical and computational sciences. I call them SMACS for short.

I am expanding my horizons, and there are infinite possibilities.

Also, I must say, I am addicted, to our ISI group of friends, from mid 70's, and we communicate daily in our yahoo group!

So, treasure your friends, and hang on to them, for the rest of your life.

## **Future Trends in Statistics**

Let me now talk briefly about, some of the exciting opportunities in statistics.

I don't pretend to have a crystal ball, to predict the future of our profession.

However, I do see a plenty of opportunities, and *challenges* ahead of us.

Climate for statisticians is hot, and getting hotter.

There is a future in computational and data-enabled sciences, and in uncertainty quantification.

Research, at the intersection of, biological and mathematical, statistical and physical sciences, will be needed.

Developing technologies, for clean energy and sustainability, are critical for our long term future.

Statisticians are needed, by *everyone- from Agronomist, Biologists, Chemists, and all the way to Zoologists!*

We have the tools, to drive discoveries and innovation, in other sciences, and provide solutions to improving human welfare.

There is a data-tsunami coming.

We are deluged with, a mud of data, to mine important nuggets of gold from it.

Massive and complex data are here to stay.

Climate data from various spatial locations over time;  
financial data that arrive at a high frequency;  
credit card companies collecting data on thousands of variables on millions of customers every day;  
departmental chains observing the consumer behavior;  
data from physics experiments with large colliders;  
astronomical data from various telescopes around the world;  
internet traffic;  
genomic data in genome wide association studies, and in drug discovery;  
health insurance records;  
administrative data from census, drivers' license, social security and tax records;  
and data related to homeland security, are just a small set of examples, where we are facing massive and complex data.

***Data, data everywhere, not a shortage of problems for us to solve!***

We are creating lots of data, useful or not.

By the end of this year, we would create over 1.2 zetabytes of data.

That is,  $10$  to the power of  $21$  bytes of data.

Statisticians with appropriate core, communication, and computational skills are the best suited, to surf this data tsunami.

We are developing 'analytics', for businesses to make decisions, in a timely manner.

We will need clever data visualization techniques, to quickly communicate results of statistical analyses.

Presenting high dimensional data, in a visually understandable format, would be very important for our profession.

Comparative Effectiveness Research, (CER), and adaptive designs, are catching on in clinical trial studies.

Computer simulations, and computer experiments also play an important role in future discoveries.

Statisticians at Google, Infosys, TCS, and other places, are developing innovative algorithms, to analyze internet traffic data, and help our searches to be faster, relevant, and meaningful.

Our ISI alumni, like the Executive Vice President and Chief Operating Officer, Ravichandran at Tech Mahendra, and the Director of Information Systems, Indranath Modak at Phillip Morris in Australia, are making significant contributions in this regard.

Statistics is an important pillar of bioinformatics, and we will continue to have an impact, in new drug discoveries, and gene therapy.

ISI alumni, like Director Partha Majumder of the National Institute of Biomedical Genomics, are making significant contributions.

I look forward to his presentation and that of Professor Terry Speed, tomorrow morning, at the ISEC conference.

I can continue talking about, the endless opportunities, for statisticians.

Now, let me also mention a few *challenges* we are facing.

Open access to data is important.

It provides opportunities for us, to verify, and validate the results.

Repeatability, and reproducibility, of scientific research are critical.

However, a large number of variables, and large data sets, also provide opportunities for, some *data crooks*, to deliberately ignore, the effects of multiple testing, and misuse statistics.

But, unfortunately, statistics and statisticians, get the blame for it.

To quote Professor Lewandowsky from Australia, "Statistics, when done properly, provide a robust, and revealing tool, to understand reality.

Statistics are anything but damn lies.

There are only some damn liars, telling untruths, based on incompetent, or malicious abuse of statistics."

Let me repeat: There are only some damn liars, telling untruths, based on incompetent, or malicious abuse of statistics.

Statistical tools are like a knife or a chisel.

In skillful hands of a surgeon, they can save a life, or in the hands of a sculptor, create a beautiful statue.

On the other hand, in the hands of a crook, it can rob a bank, or even kill a person.

It is important that we handle the tools, carefully, and earn, and retain, the trust of the public. And, may be go beyond, and expose the crooks and damn liars.

This is a good segue to my final topic, where I borrow the advice for our graduates, from my colleague Professor Rawlings.

**This is Some Friendly Advice for our graduates today:**

As a statistician, we must interact closely with researchers, and practitioners, in other fields, if we are to make, our statistical tools relevant, to the rest of society.

Thus, the linkage with other sciences, is essential, to the life of statistical sciences.

In order to do so, you must sharpen your core, communication, and computational skills, continuously.

You must really understand the theory, and methodology, and keep abreast of, new developments.

You can't simply apply cookbook methods, to which you have been exposed to.

Don't be a hammer, looking for a nail to hit. Use the appropriate tools, as needed.

Do not attempt to use statistical methods, unless you understand, the underlying theory.

You must have a strong foundation, in statistical theory, and inference.

Otherwise, anything you build on a weak foundation, will collapse, sooner or, later.

There will always be data, that do not quite "fit", the recipe you might have learned, or problems that do not ask, the "standard" question.

If you are going to be a successful statistician, you must always be, "going to school" -- learning new techniques, developing ways to answer, new questions, etc.

You must be, forever learning, or you will quickly become, obsolete.

To quote Einstein, "Strive not to be a success, but rather to be of value."

If you are valuable, you will attract success.

So, Strive not to be a success, but rather to be of value.

Trust takes a long time to build, and you can lose it, with one mistake.

Your integrity is essential, for your success as a statistician.

As a statistician, you will have, access to the basic data,

you will do editing of the data,

you will be the one, that extracts the essential information from the data,

and often the one, that makes the fundamental conclusions.

If management or your scientific peers, ever have any reason to question your integrity, they will lose faith very quickly, in what you claim the data have to say.

Therefore, it is *essential* that, you carefully guard your objectivity, and your integrity.

Even if your aim in "doctoring the data", were to satisfy management at one turn, management would then be aware of, what you are willing to do, and would have every reason, to question your results, at the next turn.

Your integrity is essential, even if it means speaking up to the management, and possibly, losing your job. Trust takes a long time to build, and you will lose it with one mistake.

You must uphold, the integrity of your profession, and, not incidentally, you must live with yourself.

Lapse of ethics, is costing billions to some companies, and having a bad impact on our profession. Short terms gains are not worth losing long term benefits.

You have the responsibility for our profession, for our institution, and more importantly, for yourself.

Please don't cut corners, help produce a quality product.

Finally, I would like to point out, an obligation you have to yourself, and to your clients.

As the statistician, you will be working with scientists, engineers, or individuals in other areas of expertise.

The easiest method of operation, the lazy statistician's way, is to sit back with the attitude, that you know the statistics, and it is the responsibility of the scientist, or your client, to come to *you* with the problem,

interpret the scientific lingo, so that *you* can understand what is being done,

state for *you* the statistical question, in which he/she is interested,

and finally, take the results of your statistical tests, and go away.

The problem with this approach is that, you become, nothing but a "computing machine", a technician.

You really contribute nothing to the process, that couldn't be done with a good computer program.

You are not only replaceable, your position, may soon be considered, disposable.

You never really become, a part of the research team.

And, further, you bring, no credit to the field of statistics.

You should be a valuable member, of a multidisciplinary team, and add some value to the outcome. Strive not to be a success, but rather to be of value.

Develop a proper attitude.

It is the *attitude*, that you are the missionary, taking statistical methods to the field.

It is the *attitude*, that you will get to know, and understand the science, or the process, and the lingo that goes with it.

It is the *attitude*, that you will go to the scientist, and interpret the statistics for him/her, rather than expecting him/her, to learn the statistics.

It is this willingness, to understand the science, that will set you apart, and eventually make you, an indispensable member of the team, not just a technician.

Your familiarity with the area of application, will lead you to see new applications of statistics, and new statistical methods, that the scientist would not have imagined.

It is this *attitude*, that will make you statistical career, *exciting!!!*

Be curious. Ask plenty of questions.

Be a good listener. Listen before you speak.

The most important part of communication is, listening.

Listen, understand, repeat what you understood, to make sure that you understood correctly, think, analyze, and then, communicate an appropriate solution.

Learn from your mistakes. You can't expect to get something new, by doing the same thing over and over again. I guess that is repeatability and reproducibility for some of you!

Seriously, learn from your mistakes, and improve yourself, continuously.

Brag, brag, brag about the importance of statistics.

Brag to your neighbors, brag to your doctors, brag to your politicians, and brag to your helpers at home.

Talk about the impact our profession has. Knowing what you know, doesn't get you anywhere. Telling people what you know, does!

Be visible. Thrive in everything you do, not just survive.

Again, Thrive, not just survive.

We are all grateful to our visionary founder of ISI, Professor Mahalanobis.

He put statistics in India, and Indian statisticians on the world map, starting almost 80 years ago.

He recruited, many outstanding researchers, and visitors to ISI.

ISI enjoyed, and is still benefiting from, a number of good Directors, and outstanding faculty and staff.

Also, ISI has many successful alumni and faculty.

It has a large potential, that is not completely realized, yet.

Under the new leadership, I am very optimistic that, ISI will continue to THRIVE!

I wish our new Director, my best wishes.

I wish him success with, his collaborations with other academic institutions, government agencies, and industry, and may be even globally.

Whether it is at ISI, or wherever your future employment may take you, make it a harmonious place to work.

More than the money you make, it is important, that you enjoy what you do, and do what you enjoy, and enjoy the place you work.

Let me share a story from my uncle, that may help you in choosing your future departments, or improving the existing ones, including ISI.

A holy man was having a conversation with God one day, and said, 'God , I would like to know what Heaven and Hell are like.'

God led the holy man to two doors. He opened one of the doors, and the holy man looked in.

In the middle of the room, there was a large round table.

In the middle of the table, there was a large pot of stew or payasam, which smelled delicious, and made the holy man's mouth water.

The people sitting around the table were, thin and sickly.

They appeared to be famished.

They were holding spoons, with very long handles, that were strapped to their arms, and each found it impossible, to reach into the pot of yummy payasam, and take a spoonful.

But because the handle was longer than their arms, they could not get the spoons, back into their mouths.

The holy man, shuddered at the sight of their misery, and suffering.

God said, 'You have seen Hell.'

They went to the next room, and opened the door.

It was exactly the same scene, as the first one.

There was the large round table, with the large pot of payasam, which made the holy man's mouth, water again.

The people were equipped with, the same long-handled spoons.

But here, the people were well nourished, and plump, laughing, and talking.

The holy man said, 'I don't understand..

' It is simple,' said God .

'It requires but one skill. You see, they have learned to feed each other, while the greedy think, only of themselves.'

That's Heaven!

Happy departments or institutions, are those who figured out that, we want to see all our colleagues succeed, and get a satisfaction, out of a combined success, than individual success.

We are all on the same team!

Whether we are in mathematical statistics or applied statistics,

in biological sciences or physical sciences,

in computational sciences or finance,

we respect each other's contributions.

It is the "Unity in Diversity", our motto.

A team can succeed, only when, the batsmen score, bowlers bowl, and fielders field!

It takes everyone's contribution, to be successful, and to lead the ship forward. As someone once said, It takes a village to raise a kid.

It is in your hands, to make our Director successful, and make ISI, or wherever you go, the place a safe haven, for diversity.

I also hope that, you appreciate, and foster collaborations, among academia, government and industry, and with global partners. Statistics has no borders!

As of today, no matter what degree you are receiving, you will be an alumnus or an alumna of ISI, forever.

You can't change that title. Be proud of this new title.

The success of ISI is ultimately measured by, your success.

ISI has thousands of successful alumni we are all proud of.

I hope, you heard about, a number of successful ISI alumni in my speech.

I have not even had a chance, to mention many of my friends here, like Sugata Adhikari and Prasantha Pathak, among many many others.

I admit, the sample I chose is very biased, and has only a small sample of some of my close friends, like my classmate here, Director Bimal Roy.

I am very proud of him. I wish you the best, with your future. So, please don't forget the key points. Remember your friends, and hang on to them.

The future trends show an optimistic market for statisticians.

The climate for SMACS is hot, and getting hotter.

Have fun playing in the backyard of many sciences!

And, please remember some of the friendly advice-

make yourself useful to the society, be ethical, earn and treasure the trust, be visible, go make a positive impact, educate and don't forget to bring others along as you move up, and last but not the least, Thrive- not just survive! Thank you!