



Indian Institute of Science

Alumni Association of North America

# 4th IISc Global Conference

Science and Technology for a Better World



21 to 23  
June, 2019



Palo Alto, CA  
Crowne Plaza Hotel

Booklet sponsored by



*L&T Technology Services*

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# Message from the IISc Director

Prof. Anurag Kumar



The Indian Institute of Science (IISc) was founded in 1909, and by the time this conference begins, The Institute (as it is often called by people associated with it) would have completed 110 years. IISc has always been a public institution for higher education and research, with the primary goals of training young students to conduct research, of discovering new knowledge in the basic sciences and in the engineering sciences, of creating innovations based on such research for the furtherance of the industry, and of making available the knowhow of its faculty and its students for the advancement of the nation.

Over these 110 years, about 25,000 students have graduated from IISc. These periodic global

conferences hosted by alumni or the Institute, the annual IISc AANA local chapter meetings, and the annual Alumni Day in IISc, are all indicative of the strong bonds between the alumni and The Institute.

In cumulative research output and citations, IISc leads the nation. The alumni of The Institute, particularly the doctoral alumni, can justifiably take pride in their contributions to the vast body of knowledge that has been created at IISc. The vision of and the aspirations of IISc cannot, however, be confined to the country of its founding. While ensuring that it continues to provide all required support to India's scientific and education establishments, national programs, and the

industry, IISc needs to benchmark itself against the best institutions of higher education and research in the world. This aspiration was implicit in Mr. J. N. Tata's own vision, when shortly after the founding of the great research universities in the United States of America, in the 1880s, he thought that India must have its own research university. Today, this aspiration is an expectation, as, through a competitive process,

**“The alumni play a vital role in projecting IISc’s achievements.”**

the Ministry of Human Resource Development (MHRD), the reporting ministry of The Institute, has selected IISc as an Institute of Eminence (IoE), under which IISc will obtain greater operational autonomy and will receive additional grants over a five-year period (grants that IISc will have to match over the same period), with the explicit expectation that IISc will rise to meet international benchmarks.

In the proposal submitted for selection to the IoE status, The Institute has committed itself to the following vision: “IISc aims to be among the world’s foremost academic institutions, through the pursuit of research excellence and the promotion of innovation, by offering world class educa-

tion to train future leaders in science and technology and by applying science and technology breakthroughs for India’s wealth creation and social welfare.”

While the onus of achieving this vision is on the faculty, students, and administration of IISc, considerable external factors will have to align to enable the vision. This is where I expect the IISc alumni, and particularly IISc AANA, to play an important role. As the Institute’s primary brand ambassadors, the alumni play a vital role in projecting IISc’s achievements and needs on the global stage, and in connecting the Institute with key stakeholders in academia, industry, government and society, in India and around the world. Recently, IISc has taken several important steps to build its alumni relations, including setting up the Office of Development and Alumni Affairs, and starting an annual reunion in December. Through such initiatives, we hope to involve alumni more intimately in the Institute’s outreach and development efforts. We also seek to organize more meetings and interactions with alumni abroad, and recruit dedicated professional staff to manage and expand alumni engagement. We also envision alumni playing a greater role in the professional development of IISc students, through mentoring, internships, conference travel support, and other mechanisms.

This global conference, organised by IISc AANA, is an important step in the directions outlined above. I would like to thank the organisers, who I am sure have spared no efforts, and I wish this conference all success.



# Message from the Chair, IISc Governing Council

Prof. Palle Rama Rao

Dear Alumni of the Indian Institute of Science,

Let me first convey to you my warm greetings and many good wishes. May I also offer you many congratulations for being Alumni of the IISc, for it is a unique academic institution the like of which does not exist in India. The IISc was unique in its founding, as it has been for more than 110 years of its history, its system of governance as well as its accomplishments. Notably, the Ministry of Human Resource Development of the Government of India has this year awarded the IISc the status of an Institute of Eminence, thereby significantly granting it additional autonomy.

From its very inception, the Institute has laid emphasis on the pursuit of basic knowledge in science as well as in engineering. The IISc today has as many faculty members in engineering as in science. Similarly, the IISc produces as many Ph.D.s in Engineering as in Science. Thus it deserves to be regarded as academically wholesome, which is yet another of its unique features. The IISc is also becoming known for its successes in the application of its research findings and faculty know-how for industrial and social benefit.

“From its very inception, the Institute has laid emphasis on the pursuit of basic knowledge in science as well as in engineering.”

It should make us all who are associated with the IISc feel proud that it has generated numerous outstanding professional leaders who have served the country with eminent success. Moreover, the IISc has incubated several National Institutes such as the Tata Institute of Fundamental Research (TIFR), the Central Power Research Institute (CPRI), the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), as well as the major information technology company, Wipro. Being India's leading research university, the IISc has contributed immensely to India's research output. Again, numerous IISc alumni, such as you all, have made a mark in various professions as well as in contributing to the domain of world research.

In more recent years, the Institute has taken several new initiatives which should become clear from the presentation that the Director Professor Anurag Kumar is due to make at the Global Conference.

Clearly, IISc is on the verge of realising its potential to achieve the coveted status of a World Class academic institution with a markedly higher position in the international ranking of world universities.

However, in order for this to happen, the IISc has to enhance both its faculty and financial resources. In regard to increasing faculty resources, the IISc needs to attract more internationally well-known scientists and engineers engaged in frontier fields of research to spend extended periods of time at the Institute. That necessitates offering them attractive emoluments. Professor Anurag Kumar will place before you for a detailed discussion several means of attaining that proposed significant goal. To realise it, the IISc proposes to organise a collective effort in which the Institute's alumni can play an important role. May I take this opportunity to appeal to you to do whatever you can to enable the Institute to attain the position of a world leading institution?

**“It should make us all who are associated with the IISc feel proud that it has generated numerous outstanding professional leaders who have served the country with eminent success.”**

Finally, allow me to exploit this opportunity to convey our sincere gratitude to you all for making the obviously enormous effort to organise this global alumni conference, which will, indeed, showcase IISc.

I wish the event every success.

*–P. Rama Rao*



*Prof. P. Rama Rao*, Chair, Governing Council IISc (2014- present), is a distinguished scientist known for his contributions to Physical and Mechanical Metallurgy. A former Vice-Chancellor of the University of Hyderabad (1999-2002), he has served in multiple roles serving academia and the Indian national research enterprise. He served as Director, Defence Metallurgical Research Laboratory (DMRL) Hyderabad (1982-91), Secretary to Government of India, Department of Science and Technology (DST) (1991-95) with additional charge as Secretary, Department of Ocean Development; Chairman, Atomic Energy Regulatory Board, Government of India (1996-99); Member, Atomic Energy Commission, Government of India (2004- ); the Brahm Prakash Distinguished Pro-

fessorship, Indian Space Research Organization (2002-07); and is the chairman, Governing Council, International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI), Hyderabad. His research involved extensive collaboration in India and abroad and he has been the recipient of numerous awards. Most notably he was awarded the Padma Shri in Science & Engineering in 1989, the Padma Bhushan in 2001 and the Padma Vibhushan in 2011, by the President of India.

# Message from the IISc AANA Co-chairs

We are honored to be part of the efforts to host the 4th IISc Global Conference, at a venue close to where the first Global Conference was held in 2007. We are privileged to be two of the 25,000+ individuals to have benefitted from the education IISc provided in its illustrious history of the past 110 years and to currently serve as co-chairs of IISc AANA. Founded in 2006, IISc AANA's mission and vision is "Giving Back" to the alma mater and to society and this year's conference embodies that with its theme of "Science and Technology for a Better World". At the outset we want to thank the very many volunteers who have worked tirelessly, clocking 1000's of hours over the past 10 months to bring this event together. Equally important our gratitude to Director Prof. Anurag Kumar and to Profs. G. Rangarajan and S. Mohan for their partnership in helping IISc AANA in its mission and in turn using the Global Conference as a platform to showcase IISc's achievements as an Institute of Eminence.

The conference organizers have brought together an eclectic mix of eminent speakers addressing topics ranging from Agricultural Technology to Artificial Intelligence, Entrepreneurship, Cutting Edge Biomedicine, Social Change and Space Technology, to name a few. There will be opportunities for formal and informal networking, mentoring and key lessons to be learned from pioneers whose career paths were shaped by their formative years at IISc. We are appreciative of the illustrious audience – alumni/ae and well-wishers - many of whom are devoting precious time to make this conference a success, by their presence and engagement. We look forward to the seeds of many innovative collaborations being sown, and existing partnerships nurtured and strengthened at this meeting.

IISc AANA is a volunteer organization with a mission of "Giving Back" to society and overseen by a Board of Directors. We value the interests, time and opinion of our alumni/ae stakeholders. Our current goals are to bolster networking opportunities for alumni/ae at all stages of their careers; strengthen the existing chapters and facilitating the formation of new chapters; provide mentoring opportunities for recent alumni/ae; encourage philanthropy, create a robust web presence; and explore new and improved opportunities to connect with IISc and its ODAA. We, at the Board, are open to suggestions and welcome your ideas. We encourage younger generation alumni/ae to get involved. This is a collective enterprise and the organization depends on its members.

We look forward to the success of the 4th Global Conference on multiple fronts—expanding our minds, enriching existing collegiality, establishing new interactions and paying tribute to the Institution that shaped our thinking and careers.

With best wishes,

*Murthy Gudipati, (IISc, 1981-1986)*

*Mrinalini Rao (IISc, 1971-1972)*

# Board Members of IISc AANA

## Board of Directors, IISc AANA

Murthy Gudipati, Ph.D. (CO-CHAIR)

Mrinalini Rao, Ph.D. (CO-CHAIR)

Gaj Birur, Ph.D.

Rama Chellappa, Ph.D.

Mohan Raj Goyal

Parveen Jain, Ph.D.

Rita Khanna, Ph.D., J.D.

Jagjit Nanda, Ph.D.

Sujata Tibrewala

## Advisory Board, IISc AANA

Yash Bhatnagar, Ph.D.

Subbarao Gunupudi, Ph.D., Chief Financial Officer, IISc AANA

Sunil Kumar, Ph.D.

Arkal Shenoy, Ph.D.

## Chapter Presidents

Washington DC/Maryland Chapter: Rita Khanna/Rama Chellappa

Chicago/Midwest Chapter: Ganapathy Dharmasankar

Houston/ South East Chapter: Guru Naik

Southern California Chapter: Gopal Chakravarthy

Silicon Valley Chapter: Pothaganahalli Droupadi



# Message from the Convener

## Parveen Jain

Dear Alumni, Faculty and Friends of IISc:

Greetings!

On behalf of the Conference Organizing Team, it is my great pleasure to extend the conference attendees a warm welcome to the Silicon Valley for the Fourth IISc Global Conference.

This year, the theme of our conference is “Science and Technology for a Better World.” In addition, one of the founding principles of IISc AANA has been “Giving Back” – may it be giving back to our Institute or to the worldwide community of which we are all a part. We have taken both of these themes to our heart and have created the conference program that reflects “Giving Back” and “for a Better World.”

We are delighted to have the alumni attending from all over North America, India and other parts of the world representing multi-generations of graduating classes ranging from 1950’s to 2018. They are bringing specialized expertise in some of the key forward-looking fields of science and technology. The conference program is tailor-made to satisfy the scientific and technological palates of all the participating generations as well as a spectrum of innovative fields of study.

“Everyone feels nostalgic and has a fervor to reconnect with the Institute and fellow alumni. We have kept these feelings in the forefront while planning this conference”

One common sentiment among the IISc alumni of all ages is that the education and training we received at IISc has been the foundational element that shaped our future – both for our advanced studies as well as for our professional career. Everyone feels nostalgic and has a fervor to reconnect with the Institute and fellow alumni. We have kept these feelings in the forefront while planning this conference – providing all possible opportunities to network and to reconnect with the Institute that shaped our scientific and technological acumen. We are very grateful that the faculty and executives of the Institute kept that in mind as well and are sending a significant contingent of educators representing various departments, divisions and disciplines.

Organizing a conference of this nature is a major undertaking. To that end, over thirty exceptionally dedicated and committed volunteers have worked tirelessly for about eight months to deliver this conference. They worked in a manner that mimics the start-up culture of the Silicon Valley. We sincerely hope that you thoroughly enjoy the fruits of our hard work.

I would like to make a special mention, with a sense of gratification, of the enthusiastic services provided by our young alumni who graduated from IISc in recent years. Active involvement of the younger alumni is very important to IISc AANA and we make special efforts to nurture their participation. With that in mind, we invite everyone to enroll with IISc AANA, and encourage you to get involved in our activities. This will help sustain the operational excellence of the organization.

We would also like to express our sincere appreciation to the Director and faculty members of IISc who worked very closely with us and promptly provided all the guidance and assistance we requested. Our special thanks go to the Board of Directors and Board of Advisors of IISc AANA as well, for their on-going help and active contributions.

Both IISc and IISc AANA have fostered a mutually beneficial relationship with a number of corporations involved in advanced technological developments. Many of them (Applied Materials, L&T Services, Jag Kotha, Google, Intel, to name a few) are sponsoring this conference, and we are grateful to all of our corporate and individual sponsors for their support.

We have tried our best to make your participation in the conference an enjoyable experience, and hope you will feel the warmth of our hospitality. However, if we missed anything, or if we lacked in some manner, we ask for your kind understanding.

We wish you all the best.

*Parveen Jain*

Convener, the Fourth IISc Global Conference.



#### IISc and my Career Path:

Like many of my friends from IISc, I believe the education and training I received at IISc was the most important factor that helped me in crafting my career trajectory. However, beyond that, I believe that IISc instilled the confidence in me to never give up and have the strength to try and excel in new frontiers. It is this fortitude which guided me to go from BS in Physics to BE in Electrical Engineering to MS in Nuclear Engineering to PhD in Nuclear/Mechanical Engineering, and then in my career, successfully transition from Nuclear Power Industry to Information Security and Big data Industries. In addition, our educators built our mental facilities to always think of “giving back.” Although I feel heavily indebted to IISc, it is the moral conditioning which propels me to do the right thing. Volunteering

for the conference is not a pay-back by any means – it fulfills my personal desire to stay connected with IISc and everything that this great institution does.

Parveen Jain

Full-time Philanthropist

Class of 1972-1975, BE-EE, IISc

# Conference Organizing Team

## Convener

Parveen Jain	BE-EE	1972-1975
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## Co-conveners

Subbarao Gunupudi	PhD Biochemistry	1969-1974
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Yash Bhatnagar	MTech Physics	1983-1985
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Mohan Goyal	ME - EE	1997-1999
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## Finance

Subbarao Gunupudi (Lead)	PhD Biochemistry	1969-1974
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## Fund Raising

Sadanand Karve (Lead)	BE-EE	1978-1981
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Murthy Gudipati	PhD Organic Chemistry	1981-1986
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Prof S. Mohan	Prof IISc	1977
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## Program

Yash Bhatnagar (Lead)	MTech Physics	1983-1985
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Usha Raghuram	PhD Organic Chemistry	1979-1985
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Nari Narendranath	MSc (Eng) - Metallurgy	1977-1980
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Yash Vaishnav	PhD MCBL	1983-1988
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## Outreach

Mohan Goyal (Lead)	ME-EE	1997-1999
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Neelima Sangeneni	PhD CeNSE	2013-2019
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Gopi Mamidipudi	MSc (Eng) CSA	1982-1985
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Guneet Walia	PhD MBU	2005-2010
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Vipin Goel	ME CSA	1991-1995
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Garima Choudhary	MSc Chemical Engineering	2006-2008
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Sunandha Srikant	BSc (Research)	2011-2015
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Kamesh Mamidipudi	IISc Alum Spouse	
Pavan Kamble	ME Mechanical Engineering	2008-2010
Tapan Goel	BSc (Research)	2012-2016
Subra Herle	PhD Solid State Chemistry	1992-1998

## Marketing & PR

Sujata Tibrewala (Lead)	ME(I) EE	1996-2000
Rachna Tiwary	M.Des	2005-2007
Shashank H. R.	BSc (Research)	2012-2016
Milind Hegde	BSc (Research)	2012-2016
Praveen Nigam	MSc (Eng)	2009-2011

## Souvenir

Shashank H. R.	BSc (Research)	2012-2016
Milind Hegde	BSc (Research)	2012-2016
Praveen Nigam	MSc (Eng)	2009-2011
Priti Hansia	PhD MBU	2002-2009
Sujata Tibrewala	ME(I) EE	1996-2000
Mohan Goyal	ME - EE	1997-1999
Subbarao Gunupudi	PhD Biochemistry	1969-1974
Mrinalini (Meena) Rao	DIISc Biochemistry	1971-1972

## Facilities & Lodging

Sanjay Patil (Lead)	MTech CEDT	1989-1991
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## Cultural

Sundeep Kohli (Lead)	MSc(E) EE	1995-1998
Aparna Gunupudi	IISc Alum Spouse	

## Hosting

Droupadi Pothaganahalli (Lead)	PhD-IPC	1979-1986
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# Excerpts from Sri NR Bhargava's Life

*Based on the letter to IISc Alumni dated October 13, 2018  
from Sri NR Bhargava, IOFS Ret., and adapted by Usha Raghuram*

Shri Bhargava loved IISc and was very much involved in IISc alumni activities until his last days. In October 2018, when he was 96 years old, he wrote a letter to his fellow IISc graduates sharing his life history and professional accomplishments spanning  $\frac{3}{4}$  of a century. This is an excerpt from his letter.

## Childhood and Adolescence

Sri Nagaraja Bhargava, a brilliant, motivated Scientist/ Engineer, had humble beginnings and was born into a large family and came up in life through hard work. His great grandfather, Karkhane Ram Chandra Rao, worked in the British Cavalry near Dharwar. After his death, his grandfather settled down in Tumkur near Bangalore and his father became a Railway Permanent Way Inspector, a very responsible and rich position for those times and took up the responsibility of supporting a large extended family.

Due to the transferable nature of his father's job, he ended up starting his education only at the age of seven at a Coolie muth, a very basic school with no amenities. He learnt alphabets and numbers by writing on sand. He joined a better school when his father moved for his job and learnt the importance of hard work and studied hard. The struggles in early life to get a good education instilled yearning in him to excel in education. Despite the constant moves, he completed the Lower Secondary (end of middle school) brilliantly standing 6th in the Mysore state. He completed SSLC as a topper in the state in 1939.



## Education

Throughout his academic career, he was at the top of his class and earned several awards and recognitions. He went on to the Intermediate College and Central College and came out in flying colors with an Honors degree in Physics. Life histories of famous physicists like Euler, Gauss Maxwell, Newton, Einstein, Max Planck, Paul Dirac, Schrödinger, Heisenberg, and Werner Pauli made a tremendous impression on him. These luminaries shaped his thinking for the next phase. Being so mesmerized by Physics, he devoured many books and in the final examination, departing from the normal rendition, used a solution from Max Born's book 'Optik' with Bessel functions for a question on diffraction of light through a circular hole.

He met with Dr. H.J. Bhabha, the youngest FRS at the Institute at the Indian Institute of Science several times with the goal to do doctoral research work in Mathematical Physics under him. At that time, Dr. Bhabha was contemplating moving to Bombay to establish an Institute for Fundamental particles and wanted Shri Bhargava to join him there. Due to family situation, he could not make the move and ended up completing a graduate degree in Electrical Technology in 1947.

### Professional Career

In spite of the excellent academic credentials, he was not fortunate enough to land a job right away due to extraneous factors—general uncertainty due to Indian independence, availability of jobs and firms needing highly specialized scientists, lack of mentorship and leadership at the department, and the departure of the department chair, Professor SP Chakravarty, due to conflicts with the management, all were contributing factors. Though starting sluggishly, through his hard work and perseverance, his career took him to heights of accolades and achievements.

### Government Postings

After a year of unemployment, he landed his first job in an apprenticeship position in Bombay at Tata Hydro in their Testing Station at Parel, in the Load & Dispatch division of Tata Grid paying Rs 100/- per month. From there he moved to Ordnance Factory in Dehra Dun in 1949 to a Gazetted position. Not knowing the Government hierarchy and protocols of behavior, he made some errors in judgement, did not make a good first impression with the Superintendent, Sri S.J. Shahaney and got poor performance reviews and was transferred to the Ordnance Factory in Kanpur in 1950. Unfaced by the setback, he turned his fortune around in Kanpur by doing an excellent job and got promoted to the position of

Assistant Works Manager. While in Kanpur, he got married in 1950 to his beloved wife Draupadi (student of Physics, Chemistry & mathematics), daughter of Sri Ved Vyas Acharya, Chief Secretary of Government of Mysore.

His next posting was in the Ammunition Factory in Kirkee from 1953–1960 and this is where his career took off. His contributions were recognized, and he got promoted to Works Manager. Subsequently, in 1961, he was posted to Gun & Shell Factory where, within a very short time, he met the target of manufacturing and supplying crawler tractors too Dandakaranya for resettlement of Bengali refugees. He even got to rectify his image with Sri Shahaney by bringing to his attention an error in a report to be sent out to MoD. Sri Shahaney was very appreciative of Sri Bhargava's keen observation and was sent to MAN Nurnberg, Germany on deputation.

On completion of this deputation, he got posted to Small Arms Factory, Kanpur, where the Multifuel engines were going to be built. He established this project and was posted to the DGOF headquarters, Kolkata as Asst Dir general Gr I.

While in Kanpur SAF, Sri Bhargava got the coveted opportunity to arrange Mr. Delmar Warnke's visits to ordnance factories all over India and to accompany him. Mr Delmar Warnke, from Westinghouse Airbrake Co, Peoria (USA), had been commissioned by the Defense Ministry to select a site for a separate Earth Mover Factory). After the tour, he was to bring Mr. Warnke to OF Murad Nagar (UP) to meet with the Admiral to be briefed as to what he has seen and whether he has selected a site for Earth Mover Factory. During his travel with Mr. Warnke, he earned Mr Warnke's trust and ended up helping him write a report to the Admiral and Defense Ministry at Delhi. Mr Warnke had recommended Bangalore as the right site. This was also the recommendation of the Hon Prime Minister Sri Morarji Desai that

the defense project be sanctioned if the site was to be the Kolar Gold Fields near Bangalore where gold mining had dwindled, and the economy of the place needed to be resuscitated by an industrial project.

In 1964, he was moved to DGOF Head Quarters in Kolkata and was entrusted with a major project to set up a new Ammunition Factory in Warangon. This project was initiated by the Defense Minister Hon Yeshwant Rao Chavan with aid from the USA called Project 800 authorized by President John F. Kennedy. The land, given by Maharashtra Govt at a place called Varangaon near Bhusaval was a remote, primitive farmland, near a major Railway Junction had to be developed from scratch. It was a major challenge to coordinate building the site, installing machinery, and planning for the grand inauguration in a very short time. He completed the project successfully in one year and earned praise from all his superiors including Sri Shahaney.

Kirkee Factory helped Sri Bhargava in setting the foundation, Cossiore Factory consolidated it, and Varangaon Project was one of the two crowning glories of his career. After the inauguration of Varangaon Factory, he was considered for a posting in London as AOCO in High Commission Office. But, due to other priorities, he was posted as the Dy GM in Gun Carriage Factory Jabalpur.

Shaktiman trucks, Nissan one-ton Gun Carriers and Jongs (Jeep-like) were manufactured for the Army in this factory. This Division was very ably manned by a Colonel Vaidyanathan. Though I made myself as competent as possible under him, he was reluctant to let go of Colonel Vaidhyathan who was to be posted back in the Army. When Col. Vaidhyathan passed away unexpectedly, Sri Bhargava filled in a large shoe by successfully dealing with outside agencies to solve difficult supply and other operational problems while heading the Vehicle Division as Dy.

GM.

## Public Sector

By God's Will and Destiny, after almost 20 years in Government jobs, Sri Bhargava moved to the public sector in April 1967 working for Bharat Earth Movers Ltd (BEML), Bangalore where he worked for 8 years, initially as Dy Gen Manager, and later as Director.

He was in command for the Earthmover Division at Kolar Gold Fields, the very same project he recommended along with Mr. Warnke. The division produced 150 machines in the very first year and the success continued and BEML was profitable for next several years. In the wake of such phenomenal production, demands by Labor Unions for bonus, etc. increased. He weathered them with suave and charm but not without troubles like gherao—perhaps the first gherao in Karnataka!

In 1975, he was offered the position of Custodian, Burn & Standard, at Kolkata and moved to Kolkata. This group of factories, originally of Sir Biren Mukherjee, had been taken over in the National Sector. They were in a bad shape, and it was not possible to reduce the labor force and streamline the operation as it was a nationalized organization and social obligation demanded that the workmen did not lose their livelihood, there was no reason to maintain them at that labor strength and he quickly realized that it was a lost cause. After much reflection and deliberation, he decided to quit as Chairman and MD and asked to be relieved when the new Government came to power in 1978.

## Private Sector

Sri Bhargava's subsequent appointments were in the private sector with Hindusthan Motors in Kolkota (August 1978–Jan 1987) as an Advisor

to the Birla Group, and then with Usha Telehoist & Usha Hydraulics (1987–1988). Though Sri Bhargava stayed with the Birla group for over 8 years, he was only in an Advisory role and was not able to bring about the necessary changes for the company to be more successful. He eventually convinced Sri CK Babu, who wanted him to continue in the advisory role, to let him leave.

One of the more successful consulting roles Sri Bhargava had was with Copper Curves, Behala, Kolkata. Sri Prasanta Roy of Copper Curves knew him well through Sri KL Vagale, Sri Bhargava's son Satiesh's father-in-law. Copper Curves wanted to move away from being captive customers to Diesel Loco works and started working for aero Industry parts. Under the watch of Sri Bhargava, Copper Curves acquired a Mazzak M/C which can machine intricate, multi-dimensional parts that are empaneled in HAL. The consultancy with them was on-going well into the retired life of Sri Bhargava.

## Retirement

In 1992, when Sri Bhargava was 70 years old, he decided to hang up his coat and go into retirement and spend quality time with his dear family. He really cherished, admired and appreciated the continuous and devoted support of his loving wife Draupadi Bhargava and their son Satiesh Chandra Bhargava. After retirement, Dr. Bhargava moved to San Jose (USA) to stay with his son Satiesh, daughter-in-law Rupa, and family. He also became an active member of the Silicon Valley Chapter of IISc Alumni Association and participate in their various functions and activities as much as he could.

*Sri NR Bhargava passed away peacefully on March 8, 2019.*





# Chitchat with Dr. Keshab Panda

## IISc, M.E. Aerospace Engineering, 1983-1985

### What is your personal connection to IISc?

IISc has been an integral part of my formative years and shaped me as a business leader and a technologist. The free exchange of ideas between our professors and students allowed us to develop a disciplined mindset along with a scientific temperament. I am proud to say that I completed my Masters in Engineering from this hallowed institution. The spirit of scientific enquiry combined with a pursuit of excellence has shaped the minds of not just me but thousands of others who are fortunate enough to be called as alumnus of IISc. The education and passion for research and academics that I received at IISc has influenced me in my later years, first as a Scientist at ISRO and eventually a CEO. So, for me IISc will always be home. My biggest takeaway from IISc has been not just that I have studied in the best University in the country, but that the attention given to social and economic issues makes you a holistic leader.



### How your work is important to the world stage in terms of “science and technology towards creating a better world”?

I believe that technology plays a critical role for the betterment of humanity. My engineers on a daily basis serve top R&D houses to create new products and services that make the industry future ready. Some of the proud accomplishments of my engineers include:

- World’s 1st Commercial Mesh Network for Grids
- Electric Aircraft of the Future
- Architecting the Smartest Campus in the world
- Solar Connectivity Drone - low cost mass connectivity to rural areas
- World’s 1st Autonomous Welding Robot

Even as we challenge the boundaries of science, the real goal of technology is to not only enhance quality of life, but also provide new avenues for growth and fulfillment.

As the head of a large technology company, it has been my endeavor to undertake transformational initiatives that contribute towards community empowerment and all-round societal development.

With strategic social investments in several key areas like healthcare, water availability, skill development, and education, among others, we foster long-term sustainable community development, and drive growth initiatives that aim to make a meaningful impact in people's lives.

To cite a simple example, we have enabled the use of mobile technology in deep rural India by the farmers to remotely control irrigation pumps. We have also provided support to bring light to the lives of rural people by bringing to them solar powered electricity. Even in the India of today, many communities have never known the benefits of electricity. It is our endeavor to provide them with well-lit streets, schools and community halls and the communities have moved from darkness to light. This will indeed have a positive impact on the education of children and the overall economic well-being

**“The free exchange of ideas between our professors and students allowed us to develop a disciplined mindset along with a scientific temperament”**

of the families.

#### **What do you want to get out of the conference?**

This conference represents the coming together of the best and brightest minds from IISc from around the world. The mission is to give back to the community which has given us so much. This is a chance for all of us to foster innovations that lead to a healthy, safe and sustainable future for India and for the world. This conference also gives us an opportunity to grow alumni relationships with industry, academia and society, and among each other.

#### **What are your motivating words to encourage Alumni to attend/volunteer?**

Knowledge grows best when shared with others. Kept to oneself it is of little use. I encourage all my fellow IISc alumni to spread the light of knowledge for the benefit of the alma mater and the society.



# The Beginning of IISc AANA

Murthy S. Gudipati, Subbarao Gunupudi, Mohan Raj Goyal, and Gopikrishna Mamidipudi

The Transformation  
IISc Alumni-Silicon Valley Chapter  
2003 – 2005

**Murthy S. Gudipati** (*aka G.S. Murthy*)

*Ph.D. (OC) 1981-86*

*Scientist, NASA JPL/Caltech*

My journey back to the USA from Germany was on my birthday, August 7, 2001, working at NASA Ames Research Center and SRI International. I came to know about IISc Alumni/ae activities by word of mouth and I remember attending the “IISc Founder’s Day” get together each year by Anita Jhunjhunwala (nee Mukherjee). The one I vividly remember is the November 15, 2003 get together with an attendance of about 80 alumni/ae at ICC Milpitas and I still have some email exchanges for this event. During this meeting it

was decided to bring several local alumni/ae groups together under one umbrella and so the IISc Alumni Silicon Valley Chapter (loosely IISc SV-Chapter) was formed and I was asked to lead this new unified



group. We formed a Steering and Action Committee (SAC). During this time, we formed the “Vision of IISc Alumni SV Chapter” as well as several Special Interest Groups (SIGs). This Vision would transform into the Vision of IISc AANA in subsequent years. We recognized that not every Alumni/ae can be active all the time (based on their work and personal priorities). Hence, we provided a mechanism to rotate from active (A) to passive (P) membership. Here is a list of those mem-

From: Murthy Gudipati  
To: KameswaraRao Akella  
Date: November 17, 2004  
Subject: IISc Alumni

Dear Rao Garu:

It was wonderful meeting you, your wife, and your son Prasad. A quantum jump of 20 years didn't make any difference in recollecting the good old days of IISc and your and your wife's kindness towards the campus students.

Have a good time in the East Coast and I'll get back to you after the December 1, 04.

Best Regards

Murthy

From: Murthy  
To: Subba Rao Gunupudi, Mohan Raj Goyal  
Cc: Kameswara Akella  
Date: June 13, 2005  
Subject: Re:iisc\_silicon\_valley

Dear G. Subba Rao,

Welcome! Prof AK Rao mentioned to me about you. I requested him to ask you to contact the Alumni. Thank you for doing so.

Best Regards

Murthy

bers in early 2004 (also read [www.IISc AANA.org/front-page-features/about-us/our-history/](http://www.IISc AANA.org/front-page-features/about-us/our-history/)): Prof. A. K. Rao (A), Anurag Aggarwal (A), Sanjay Gupta (A), Mohan Raj Goyal (A), Sadanand Karve (A), Murthy Gudipati (G S Murthy) (A), Gopi Mamidipudi (A), Animesh Mukherjee (A), Anita Mukherjee (P), Ravi Kiron (P), Velu (P), Kailash Joshi (P), Deepak Bangalore (P).

During this period, I had plenty of time at my disposal as my family was still in Germany (awaiting their Green Cards) and I was in the USA. So, in addition to my research I regularly hiked in the surrounding mountains and also got IISc SV-Chapters organized. During that time, I heard that Prof. Akella Kameswara Rao was in town. I contacted and met with him (on the previous page is my email to him). I used to pick up Prof. A.K. Rao from his home in Palo Alto and drive him to each of our IISc Alumni meetings. I cherished these drives, when we had robust conversations on how to improve education and research

in India.

On my regular hikes on weekends, quite a few IISc Alumni/ae used to join. This culminated in a camping and hiking trip that I organized to Yosemite National Park with a plan to do Half-Dome hike the weekend of July 4, 2005. Shortly before that Prof. A. K. Rao introduced me to Dr. Subbarao Gunupudi (above is the first email contact with Subbarao). Note that Mohan Raj Goyal, who has been another pillar of IISc AANA was copied in this email. This changed the course of IISc Alumni Silicon Valley Chapter into IISc AANA in the hands of Subbarao Gunupudi, Mohan Raj Goyal, and many other dedicated Alumni/ae since then.

I left the Silicon Valley at the end of 2005, we had a Farewell get together organized by the IISc Alumni Silicon Valley Chapter on November 20, 2005. On the next page are a couple of photographs from Yosemite and Farewell.



*Farewell get-together on November 20, 2005 as Murthy was leaving Silicon Valley. Prof. A. K. Rao and his wife (bottom right), Mohan Raj Goyal with his daughter (bottom left), and many other alumni (top).*



*Historic trip to Yosemite National Park on July 4, 2005 that led to the birth of IISc AANA. Subbarao and Aparna (left), Murthy with IISc Alumni and friends on the top of Half Dome (right).*

## Birth and Growth of IISc AANA

### Subbarao Gunupudi

*Ph.D. Biochemistry*

*CEO, Dx-Sys Inc., 897 Independence*

*Ave 4E, Mountain View, CA 94043*

The key members of IISc Alumni Association of Silicon Valley (IISc AA-SV) who brought me into the Alumni group in 2006 are Murthy Gudipati and Prof A.K. Rao. When Prof A.K. Rao introduced me to Murthy and asked me to become active in the IISc AA-SV, I was not very keen to join the group since most of them were from Engineering or Computer Science and not from Biological Sciences. I was trying not to get involved in the alumni events until Murthy Gudipati organized a camping trip to Yosemite in 2005. I joined the camping group along with my wife Aparna and two daughters, Anupama and Ranjani. We came

to know that Murthy was the Chairman of the IISc AA-SV, which had a Yahoo group, and that the IISc AA-SV had monthly meetings at the India Community Center in Milpitas, California.



At the time, Murthy was moving to Southern California and he managed to convince Ashok Sinha to take his place to continue as Chairman of the IISc AA-SV in early 2006. Prof Mohan, Air Vice Marshal Krishnan and Prof Dattaguru visited the Bay Area in May 2006. Mohan Raj Goyal played a key role in setting up the agenda and organizing the meeting on May 18, 2006. This meeting paved the way for IISc AA-SV to connect with the alumni in San Diego and Chicago. It was Prof Mohan who connected Arkal Shenoy from San Diego and

**From:** Subba Rao Gunupudi

**Date:** October 14, 2006 Time: 5:00 PM

**Place:** Building 16, Applied Materials, 2801 Scott Blvd., Santa Clara, CA

**Purpose:** Adopt Bylaws for the IISc AANA and Elect Board of Directors and Conference committees

**Attendees:** Mohan Goyal, Satya Ramachandran, Yash Bhatnagar, Ram Akella, Subba Rao Gunupudi, Jitendra Yadav, Anita Mukherjee, Prafulla Mishra, Chakk Ramesha, K.S. Sree Harsha.

**Over Phone:** Kailash Joshi, Murthy Gudipati, Sashidhar Tadanki, Muralidhar Ghantasala.

1. Election of Board of Directors: Ram Akella, Ph.D., Subba Rao Gunupudi, Ph.D. and Yash Bhatnagar, Ph.D. were elected as Directors of the IISc AANA. Prof. Ram Akella was elected as the Chairman of the Board.
2. IISc AANA Bylaws: The Bylaws were prepared by the Bylaws Committee and were presented by Subba Rao. Members voted overwhelmingly in favor of adopting the Bylaws proposed by the Bylaws Committee.
3. Global IISc Alumni conference – 2007: The theme of the conference was discussed. Following Committees were formed ...

Muralidhar Ghantasala from Kalamazoo with the Silicon Valley group and suggested the idea to plan for a larger joint meeting. I was attending the monthly meetings held in ICC along with Mohan Raj Goyal, Gopi Mamidipudi, Sanjeev Ukhalkar, Anita Mukherjee, Dinesh Tirumurthy, Jitendra Yadav and several others. Murthy and Mohan had also set up several special interest groups – SIGs, including one on Education, which met in my Mountain View office. The members of this group included Ram Akella, Yash Bhatnagar, Satya Ramachandran, Anita and Mohan Goyal. During this time, we suggested that we incorporate the Alumni association as a Non-profit organization and make it a National or Global organization. I took the lead and offered my office space at Dx-Sys Inc. for the IISc Alumni Association of North America and thus IISc AANA was born. We incorporated IISc AANA as a Public Benefit Corporation in California on July 24th 2006 and subsequently at a General Body meeting on October 14, 2006, a Board of Directors (BoD) was elected, with Ram Akella as the Chairman. (Excerpts from the minutes of that meeting are on the previous page.)

Immediately following the General Body meeting, Murthy Gudipati and Gopi Mamdipudi, the key members of IISc AA-SV were added to the list of BoD. Arkal Shenoy, Muralidhar Ghantas-



*The organizing committee members of the first IISc Global conference.*

ala and Satish Nagarajaiah were then elected as directors by the BOD.

The formation of IISc AANA led to the formation of IISc AANA Chapters and IISc AA-SV became IISc AANA- SV Chapter. Prof Mohan's suggestion of a joint meeting with alumni from San Diego and Chicago morphed into a Global conference. IISc AANA decided to organize the first IISc Global Conference in the San Francisco Bay Area. We chose the theme of the conference as "IISc: Next 100 years," since IISc was preparing for its centenary celebrations. I visited IISc in October 2006, met with the IISc AA when Prof. Dattaguru was the President and they were enthusiastic to participate in the Global conference. Ram Akella worked tirelessly to bring the Director Prof. Balaram and Associate Director Prof. Balki to the conference. In the beginning of 2007, Parveen Jain and Prof. Mohan as Co-conveners formed a great organizing committee team. The conference was inaugurated by President Abdul Kalam and was a great success with  $\approx 30$  faculty from IISc and  $> 300$  alumni among the 400+ attendees.



Another significant event organized by IISc AANA in 2007 was the Round Table conference with President Abdul Kalam in which we had invited selected groups of IIT alumni and TiE members. The main purpose of the meeting was

to discuss effective collaborations between IISc and IITs to address the needs of the country.

IISc AANA has a three year term for the Chairman and in 2009, the BoD elected Yash and Subbarao as Co-Chairs of the organization who served until 2012. Arkal Shenoy and Satish Nagarajiah were Co-chairs from 2012 – 2015; Sunil Kumar and Gaj Birur from 2015 – 2018 and Murthy Gudipati and Mrinalini Rao have been Co-chairs since 2018. Most of the former Co-chairs are currently on the Advisory Board.

IISc AANA has been supporting several programs at IISc which include the Notebook Drive, Samanway, Student travel, KPA fund, VVS Sarma memorial Lectures, Fundraising activities of ODAA, etc. IISc AANA has transferred over \$300,000 donations from IISc Alumni to ODAA in the past two years.

IISc AANA organized several conferences during the past decade including the following:

1. **2007** First IISc Global Conference in June, Round Table Conference with President Abdul Kalam in September
2. **2010** IISc AANA National Conference in

U.C. San Diego

3. **2012** IISc AANA West Coast conference in U.C. Irvine, California
4. **2013** Second IISc Global Conference in Chicago
5. **2015** Third IISc Global Conference in IISc Bangalore in collaboration with IISc AA
6. **2015** IISc AANA West Coast Conference in Milpitas, California
7. **2017** IISc AANA National Meeting in Washington D.C.
8. **2018** IISc AANA National Meeting in Chicago

The Fourth IISc Global conference being organized at Crowne Plaza, Palo Alto, California, June 21–23 is expected to bring more participation from recent IISc graduates into the organization and create opportunities for networking with both entrepreneurs and academicians. It is time for the next generation of IISc graduates to take the lead and grow the IISc AANA into a strong and more effective organization.

## My journey of IISc AANA from inception till today

**Mohan Goyal**

*M.E. Electrical (1997-1999)  
Director of Engineering, Zaplabs Inc.*

After graduating from IISc in January 1999, I joined a startup's Chennai office and moved to Palo Alto in Oct 2000. In spite of being quite busy at startup, I used to miss Indian social life and in hunt of old friends I got reconnected with Mr. Anurag Agarwal in 2002. Anurag ji is my senior from undergraduate college as well as from IISc. He connected with other IIScians, namely Sanjay

Gupta, Pranay Pogde, Bala and others. Anurag ji asked me to join these informal meetings. Initially I was not very keen, but he had a vision to build grand alumni association and convinced me. I formally joined `iisc_silicon_val-`



ley yahoo group in June 2003. We had our kick off meeting on 12th July 2003, attended by seven alumni namely Anurag A; Sanjay G; Bala K; Mo-



han G; Sudeep G; San A and Kiran B.

A need to build a large alumni platform was discussed and it was decided that the group will meet at the Sunnyvale Starbucks at 10:00 a.m. on the 2nd Saturday of every month to keep the momentum going. Following key activities were Identified:

**Activities / Responsibilities:**

1. Research other Yahoo Groups; work on unification: Kiran B
2. Research Intranets of large enterprises to find existence of other IISc alumni groups:
  - i. Sun Microsystems: San A
  - ii. Cisco: Sanjay G
  - iii. Oracle: K Bala
3. Acquire the official alumni list of the institute and invite members to join: Mohan G

I have been actively involved since 2003 and there were several small IISc Alumni groups in Silicon Valley, such as IISc\_Friends (Anita, Animesh, Gopi Mamidipudi etc.), IISc\_Silicon\_Val-

ley (Sanjay, Anurag, Dinesh, Kiran, Mohan, etc.), and 86-87-88 (Jawahar, Raj Srivastava, Atul, etc.). These groups had their own activities in their own network. Several Starbucks meetings trying to connect all these groups together resulted in a first grand get-together in November 2003, which was attended by over 80 people. This get-together nurtured the seed of IISc AA SV and credit goes to Sanjay Gupta, Anurag Agarwal, Mohan Goyal, Kiran, Anita and Animesh Mukharjee. Since then, the IISc alumni group has been meeting on and off every month.

Dinesh Thirumurthy joined us towards end of 2004 and we aggressively ran the membership drive for several months to raise iisc\_silicon\_valley membership. Dinesh, Anurag and I ran a membership marathon for 6–12 months in 2005–2006 and our membership crossed more than 300 alums. During this marathon we met with Prof S. Mohan, Ramesh Gupta, Murthy Gudipati, Prof A K Rao, Sadanand, Sanjeev Ukhelkar, Ashok Sinha, Anil Chaudhary and many more. Murthy was elected as first IISc AA SV President; however he moved to the East coast in 2005 and



Ashok Sinha was elected as President of IISc AA SV. Murthy pulled Subbarao and others in 2006 and in May 2006, Prof Dattaguru, Prof Mohan and AVM Krishnan visited Silicon Valley and we had a get-together in Swagat Milpitas. During this meeting, Prof S. Mohan floated the idea of a Global Conference which resulted in First Global Conference, 2007.

In 2006, I was involved with Subbarao crafting by-laws, filing Article of Incorporation and creating IISc AANA. IISc AA SV became a chapter of IISc AANA and Ashok Sinha become first president of IISc AANA. Since then I am actively involved in IISc AANA activities and do whatever is required to help fellow IISc alums.

## A Die-Hard Fan

**Gopikrishna Mamidipudi** (*B.E. ECE, 1979-82 and M.S, CSA, 1982-85*) and *die-hard fan of C-Mess!*

My wife Kameshwari and I moved to the US in October, 1997, and to the Bay Area in January 1998. I was excited to move to Silicon Valley. This was around the time when the world was all about the Internet, the dotcom boom and it was all happening here. It was quite a change from a very laid-back New Zealand where we had spent the previous decade. We first landed in Los Angeles and stayed with Ravi Govil (1982-85, BE School of Automation). (Pictures from October 1997 below, with Ravi Govil and Vivek Khanna on the right and Kameshwari on the left.)

At the time I only knew of one IIScian in the Bay Area, Dhiru Pandey (1984-87, School of Automation). It was he who helped me find my apartment and settle in. In fact, he also helped me with a lot of my initial purchases with his membership at Costco—a big deal then.

We had a chance meeting with Anita and Animesh Mukherjee in early 2000, at a Starbucks at the junction of El Camino and Lawrence Expressway in Santa Clara. This was when we thought of seeking out other IIScians. Over the next few months we managed to find a bunch of IIScians from the 1978-1990 batches.



And we did it—the first IISc Alumni meet in the summer of 2000. We established contact with Tarun and Kaberi, Naishadh Desai aka Gandhi, N Ramesh, Kumar and Revathy, Deep Tej Singh (aka Kim Singh). The pictures below were taken at that first Alumni meet, way back in early 2000. It was at a Restaurant in Mountain View called Man Pasand.

A few years later, in 2003, we had a “picnic” at the State Park in Palo Alto. It was a quite a large gath-

ering with over 15 families. Meenakshi Kaul-Amit Basu and Kumar-Revathy were residents of Palo Alto at the time and managed to get permission for this large group from the Park management. It was a great party! (Pictures from the Alumni picnic in 2003 on the next page.)

Over the next many years we would meet once a quarter. In subsequent years we got Ram Akella and his father Prof. A K Rao (Aeronautics) involved and the rest is history.

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## Shifting Conversations: A Spousal view

### Kameshwari Mamidipudi

Growing up, it was all about the IITs in my family. I myself do not have a tech background but many members of my family, immediate and extended, graduated from IITs. When I married Gopi, the picture changed completely. All talk now was about IISc. Gopi, his brothers and some of his cousins had studied at the Institute and his father had taught there.

I got involved with IISc AANA from its very early days primarily because of Gopi's attachment to all things IISc. He treasures the time he spent there and many of his closest friends to this day are from IISc. I have thoroughly enjoyed the journey so far. I have met many nice, intelligent, successful, unpretentious, helpful, fun folks along the way. Volunteering for the 2007 Global Conference was a fantastic experience. It is obvious to me that this network carries tremendous value and I am happy to invest time and effort to help it achieve greater success.

## How I joined IISc AANA

### Usha Raghuram, *Ph.D. (1979-1985)*

When I needed verification of my PhD from IISc as part of employment at Stanford, I did not know who to contact. Thought that alumni association would be the right place to approach and searched the web for the phone number. When I called, Subba Rao picked up the phone. I had known Subba Rao for over 20 years, but neither of us were aware of the IISc connection. I got the required contact information from him and thus became a life member at IISc AANA.

## IISc Values – A Driving Force

### Sadanand Karve, *BE-EE (1978-1981)*

So many entities make up your life, your parents, your family, your schools, and the list goes on.

IISc is probably the most significant entity in my working life which taught me the balance between pride and humility. The little I contribute to IISc AANA, I do so with the selfish aim of reliving my days at IISc and bringing a spotlight on IISc values.



*Above: The first IISc Alumni meeting at Man Pasand in Mountain View, in early 2000.*

*Left: A IISc Alumni picnic at the State Park in Palo Alto in 2003.*



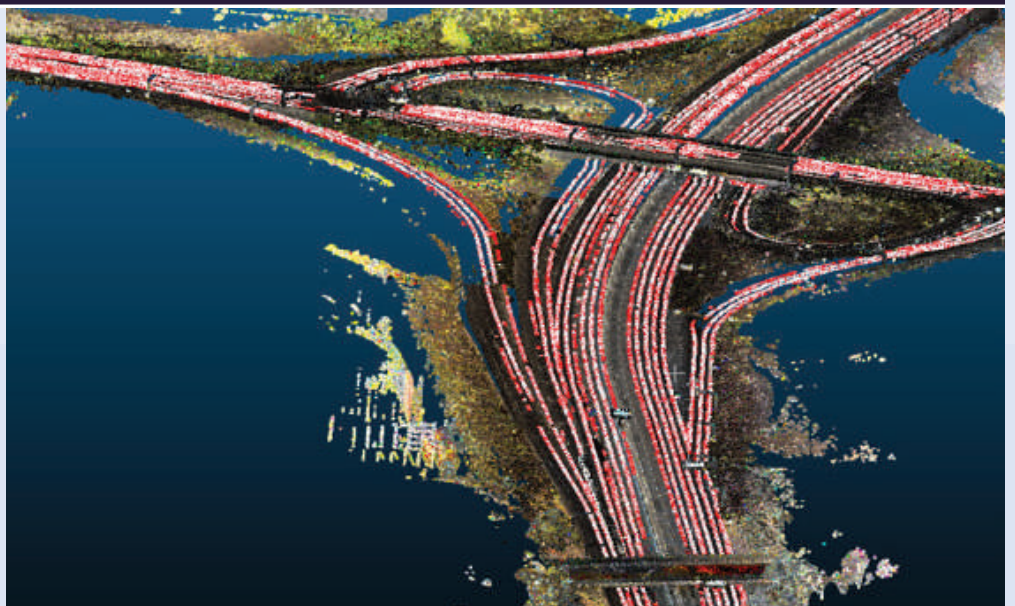


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# Science and Technology for a Better World

A to T through the Lens of  
the IISc Diaspora

# Artificial Intelligence, Industrial Revolution, and India

Sargur Srihari (IISc, BE - CSA, 1966-1970)

SUNY Distinguished Professor, University at Buffalo,  
The State University of New York

Human civilization has been profoundly changed by three industrial revolutions. They can be referred to as the mechanical revolution (the advent of the steam engine in 1825), the electrical revolution (the advent of alternating current in 1890) and the computer revolution (advent of the IBM 360 in 1970). We are now in the early stages of the fourth industrial revolution, that of artificial intelligence (advent of deep learning in 2015).

capable of learning from examples. It became practical with an algorithm known as backpropagation which was invented in the 1980s. With a multilayer perceptron, better known as deep learning, spectacular achievements have been made recently. Not only with images and speech but also with reasoning and creativity. Unlike other software innovations, the developments in deep learning are deeply rooted in mathematics, e.g., variational calculus, deriving inspiration

"We are now in the early stages of  
the fourth industrial revolution,  
that of artificial intelligence"

Artificial intelligence (AI) is in everyday use today. We are using AI when we search using Google, speak using SIRI/Alexa, get help in composing messages on Gmail, have people recognized on Facebook posts, etc.

Advances in AI have been made possible by advances in an approach based on artificial neural networks. It was first put forward in the 1950s in a device known as the Perceptron, which was

from statistical physics.

The Turing award for 2019, the equivalent of the Nobel prize for computer science, was awarded to the inventors of backpropagation and deep learning. They are Geoffrey Hinton of the University of Toronto, Yann LeCun of New York university and Yoshua Bengio of the University of Montreal. Interestingly, they are all outside of the usual

centers for computer innovations in the east and west coast of the United States.

In systems exhibiting AI there are now of two kinds of code. Software 1.0 refers to code written by human beings. They are conventional logic-based programs. Software 2.0 refers to code produced by deep learning algorithms which learn to perform from large quantities of data. While Software 1.0 is meant to be readable for debugging, Software 2.0 tends to be user-unfriendly since the mapping from input to output is determined automatically. However, Software 2.0 is more efficient and easily mapped into silicon, since it largely consists of matrix multiplications.

Research in AI is on several fronts. One of these is “explainable AI”. Another is removing bias by using better data sets. However, there is much scope for research in the mathematical underpinnings

of AI. In topics such as variational autoencoders, generative adversarial networks, deep reinforcement learning, etc.

India is well-positioned to take advantage of being a player in AI development. This is due to the large number of young people (with a natural inclination towards technology) and an innate talent for mathematics. With widely available internet connection in India, they can download software tools for AI development, such as Tensorflow and, Pytorch, and use hardware resources such as GPUs made available by the technology majors, such as AWS, Google and Microsoft. India’s planning commission, known as NITI Aayog, has put out a forward-looking document for AI development in India.



# Environment

## Smart Management of Our Natural Resources with AI and IoT

Dr. Sudhir Kshirsagar (IISc, BE 1970-1975, ME 1975-1977)

President, Global Quality Incorporation

There is a great opportunity for leveraging the advances in Artificial Intelligence (AI) and Internet of Things (IoT) to improve the management of our natural resources. In two of our most critical resource areas, water and air, one can find plenty of examples where the adoption of poli-

**"A great opportunity for leveraging the advances in Artificial Intelligence (AI) and Internet of Things (IoT) to improve the management of our natural resources."**

cies and practices that are based on the data and decisions provided by these technologies can increase economic efficiencies and reduce waste. The so-called non-revenue water (leaks, breaks and thefts) portion is about 15% in a typical water utility in the USA, and it has been very difficult to pin-point the "non-revenue" areas in the past given the lack of monitoring devices across

the entire system. Capture of appropriate water quantity and water quality data using inexpensive yet robust IoT sensors, and the advanced analysis of the resulting "Big Data" with AI techniques can certainly improve leak detection.

An example on "clean air" side would be the prevention and management of air pollution caused by industrial emissions and natural wildfires. Existing air quality monitoring stations are expensive and sparsely located. The implementation of a large grid of "micro weather stations" that are funded by public-private partnerships can provide a much better picture of the micro-climates, and the new knowledge can be leveraged to create more effective prevention and management methods.

In summary, there are clear benefits to the use of AI and IoT in environmental management, but the adoption of these technologies lacks adequate economic drivers. Significant public education coupled with massive public-private partnerships will be needed to generate the required momentum to get the ball rolling.

# Mental Health

## Is Mental Health about Surviving or Thriving?

Dr. Anita (Jhunjhunwala) Mukherjee (IISc, BE-CS 1982-1985)

Psychologist, Author, Engineer, San Francisco Bay Area

*Editors Note: Some recent graduates of IISc's new undergraduate program are now pursuing graduate studies in the U.S. They had a strong presence at the 2018 National IISc AANA Meeting held in Chicago. An important question they had of IISc leadership and more senior alumni is how are mental health issues for students being addressed. Dr. Mukherjee's essay provides an interesting perspective.*

Is Mental Health about Surviving or Thriving? That's the debate I found myself embroiled in recently. Agreed that insurance pays only for medical necessity which I think translates to "Are there threats to one's survival?" But, have I given up a promising career in software engineering and pursued psychology for years to simply help people survive? Not really.

Life had presented a series of difficult challenges and I'd found myself surrounded by questions, feeling thoroughly bruised so much so that the desire to survive was in question. Only questions, only a bunch of "why, why, why" and no path out of the web I found myself in! I knew I was drowning and the mental strength needed to keep kicking my feet was diminishing. On top of it, I was very upset with myself for feeling that way. Objectively, I did have more than many, more than I'd had in the past; then what right did I have to feel this way? But that cognitive knowledge, rather than helping me, was pushing me down further.

I sought professional help when I realized I

couldn't do it alone. The medicines prescribed did nothing except to make me feel worse. Thought a psychologist would help me find my answers but that experience left me more frustrated and with more questions. I sought my answers in spiritual organizations and they did help but only to a small extent as I was put off by the underlying sales pitch. Yet, there is certainly gratefulness for the spiritual pearls I discovered...

I forced myself to get busy volunteering intensively with people at risk—Suicide and Crisis Center, Rape Crisis Center, Veteran Center and so on. To my surprise, through the calls I answered on the crisis hotline, I discovered that while I could do nothing much to help myself directly, I was able to help the callers get out of their web, at least temporarily. Oh, so my life which didn't seem of much worth to myself seemed to be of value to others! And when I was able to turn callers from crying to smiling at the end of 30-60 minutes calls, I did feel good. The positive comments helped me find some of my confidence back. Yet, there were times, I didn't know what to say to

the callers. The situations they described were so tough and all the training I received seemed so inadequate!

And most of my “whys” were still unanswered. I was a seeker who was looking for answers to the questions that surrounded her. So, I finally sought help in what had always been my strong suit—education! Yes, I enjoyed studies and was always a good student.

The Masters course in Marriage and Family Therapy that I first enrolled in, however, was quite full of disillusion. I was going there with an attitude to learn how to help others better but often the students and instructors were more concerned about how to make money in this field. I don't blame them. After all, therapists need to survive too but shouldn't the first and foremost concern be how to enable, how to strengthen the client so that they can deal with the challenges? Isn't the goal of therapy to try and put the client in a position that the services of the therapist are not needed just as the goal of any doctor, psychiatrist included, is to treat the condition so that their services are no longer needed?

Fortunately at that time, I heard of a doctoral course that had classes on weekends supplemented by online discussions during the week. That was a Sunday. I contacted the institute on Monday; went there personally on Tuesday and a few hours later, I'd signed up for the doctoral program in counseling psychology which had a reasonably large research component, something that I was very interested in. The first course I attended was on multicultural counseling taught by an African-American professor which talked about things I wanted to learn, perspectives that resonated with me. Next semester, there was a course on research methods which was thrilling. Entirely different from the research I carried out for my Master's thesis in Computer Science, the research in Social Science seemed far more relevant. I also

had an opportunity to work with the professor, who had many publications, on writing a paper for research conducted on cancer patients. This was only a couple of years after my beloved sister had lost her battle with cancer, so...

The next few years presented unforeseen challenges but I was a survivor. When I joined, I was clear that I'm an engineer and that is going to

“When people are suffering, just teaching them how to survive is not motivating enough.”

remain my main profession. This doctorate in psychology was to find my own answers, to find a healing balm for my internal wounds, and to learn more so that I could better help at-risk populations I was working with as a volunteer. But, over the next few years, without my conscious knowledge, that story changed. My self-identity changed. An engineer turned into a psychologist!

And in the process, somewhere over the years, I began to heal; I found reasonable answers to my questions, and was content with leaving others unanswered as I started having faith that when the right time comes, those questions will be answered too. From a person who had lost the desire to fight or live, I turned into a person who found joy, contentment, and meaning in her life.

I had healed and now I very much wanted to pass on that healing to others as I saw so much avoidable suffering around me. I believed that

unfulfilled potential, that is, the inability to reach the heights that one knows one could reach, or should have reached, causes much of this suffering. My “seeker” self was ready to embrace the “healer” self. I came to this field with a clear goal to reduce this avoidable suffering and to help clients in their journey towards achieving their full potential, towards thriving!

When people are suffering, just teaching them how to survive is not motivating enough I think. We need to give them hope that they are capable of much more; that all the troubles of the present are only temporary, and that the dreams that they had envisaged for themselves are waiting to be fulfilled. Or perhaps they found themselves in such a big hole for such a long time that they have not even dared to dream. So I encourage them to start thinking about such dreams, to start having faith in themselves and in the process.

I do my utmost to make my clients think about thriving and not just surviving. It usually begins with improving their self-understanding; they learn aspects of self that they were not aware of. Their internal dialog slowly (and sometimes very rapidly) starts to change. They discover new strengths in themselves, and by focusing on these strengths, they start achieving goals that they can feel good about. They start finding fulfillment, a sense of accomplishment, and contentment. They

also realize that feeling content does not mean they’ll not continue to strive on the journey to do better but it’ll mean that they are also satisfied and happy with where they are. They’ll start taking time to relish what they’ve already accomplished. They’ll stand and stare and enjoy what they have rather than just running after illusive goals, always discontent.

I fondly recall the discussion I had with one of my clients who had reflected on “Contentment is the Enemy”. For him, contentment meant stagnation, the end of growth. And we went back and forth in our verbal duel on how contentment really enables you to experience growth in a relaxed way. When the stress to run after something goes away, one can move from strength to strength, achieving heights previously unheard.

So yes, I can say with conviction that I believe mental health is all about thriving and not merely surviving! Surviving challenges is necessary but not a sufficient condition for any sort of health, be it physical or mental. Let’s not forget the definition of Health in the constitution of World Health Organization (WHO), “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”.

# Safety

## Vision-Based Driver Safety Monitoring at the Edge

Netradyne, Inc.

Road accidents are the leading cause of loss of life and property with more than 35,000 deaths in the US each year, about \$800 Billion in financial loss due to road accidents each year, and a global estimate of 1.25M deaths annually. Further 94% of accidents are due to driver related reasons according to the “Traffic Safety Facts” report from NHTSA.



Autonomous vehicles offer the potential of improving road safety but will take a long time to replace the large installed base of human driven vehicles. There's a need to invest in our drivers now to have a meaningful impact on safety. We look to leverage the same autonomous vehicle perception technology to improve driver behavior, but with a reasoning layer, rather than a control layer.

The Netradyne Intelligent Driving Monitoring System (IDMS) is comprised of the Driveri after-market windshield mounted device, the fleet safety web dashboard, and the driver phone app and safety manager coaching phone app, as

shown below. The Driveri device runs the perception stack at the edge, detecting both the outward road environment: cars, lanes, traffic signs, traffic lights, road markings, etc., and detecting the inward cabin environment: driver full body pose, seat belt, eyes, mouth, etc. Additionally, Driveri leverages and collects additional GPS and IMU (accelerometer/gyro) sensor data, and also ties into the vehicle CANBUS to gather vehicle data as well. All of this information is compressed into semantic meta-data for efficient upload sizes for every second of driving and sent to the cloud.

All of these feeds into a reasoning layer on the device, which analyzes for various driver behavior, both particularly good and areas that can be coached. For example, driver stars are positive events, such as the driver moving over for a vehicle in the shoulder, or actively creating driving separation after getting cut-off. Similarly, coachable out-ward events include things like red-light violations, sign violations, following-too-close, speeding too fast based on posted speed signs, and too fast based on relative speed of surrounding traffic. Coachable in-ward events include distracted and drowsy driving, not wearing a seatbelt, and talking on a cellphone. Further, the real-time processing on the device enables real-time in-cab alerts, as well as the dashboard and phone app alerts.



Videos for alerts of interest are pulled for driver coaching, as well as event exoneration. Examples of annotated videos below show the value of our development and labeling pipeline for developing robustness to different geographic locations, such as India and the US, and different weather conditions, such as detecting posted speeding violation in rain:

This approach enables fleets to realize improved risk assessment through the Netradyne GreenZone™ driver and fleet scores, improve Driver Retention by recognizing and rewarding good drivers and positive driving, reduce risk by improved driver coaching, and improve claims management by increasing the efficiency of the claims process with video and analytics.

Further, the semantic meta-data is used for data exhaust, such as generating dynamic high-definition maps with lane level feature information. Fleets vehicles with Driveri devices drove over 25 million miles in April 2019, which is about 10x the amount of the 2.7 million miles of paved road in the US and growing exponentially month over month. This provides multiple passes of many road segments each month.

IoT with edge-based computing allows access to vast amounts of data that was simply not accessible before. There is a significant opportunity across different industries to analyze this data and extract meaningful, actionable information.



# Security

## Next-Gen Smart and Resilient Security

The core fabric required for the Success & Future of Artificial Intelligence (AI) and Machine Learning (ML)

Madhukar Govindaraju (IISc, ME-CSA 1988-1990)

When I walked through the doors of the Department of Computer Science and Automation (CSA) (in the mid-late 80's) at IISc., I always wondered how does Computer Science relate to Intelligent Control Systems? Where do the boundaries of hardware (and systems) cross-over

to software? How does Automation drive impact on local, national and global communities? It was not just a name of one of the most prestigious Departments at IISc., there was something more to it. The world-class, cross-functional faculty at the Department of CSA, was not just a coinci-

dence, but they helped shape the future for many of us ... I can easily say for all of us in some shape or form.

Throughout history, technology-driven transformations have delivered quantum leaps in produc-

"The world-class, cross-functional faculty at the Department of CSA, was not just a coincidence, but they helped shape the future for many of us"

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began assisting human intelligence, a transformation that continues to disrupt operational models and create new opportunities for all of us.

Today, AI and ML technologies are making a big impact on how people work, socialize and live their lives. As consumption of products and services built around AI and machine learning increases, specialized actions must be undertaken to safeguard not only your customers and their data, but also to protect your AI and algorithms from abuse, trolling, and bias. Machine Learning models are largely unable to discern between malicious input and benign anomalous data. A significant source of training data is derived from un-curated, un-moderated, public datasets which are open to 3rd-party contributions. Attackers don't need to compromise datasets when they are free to contribute to them. Over time, low-confidence malicious data becomes high-confidence trusted data, provided that the data structure/formatting remains correct.

Also, given the great number of layers of hidden classifiers/neurons which can be leveraged in a deep learning model, too much trust is placed on the output of AI/ML decision-making processes and algorithms without a critical understanding of how these decisions were reached. This obfuscation creates an inability to "explain the generated insight" and makes it difficult to strongly defend the AI/ML findings, when called into question. To make this problem worse, AI/ML is increasingly used in support of high-value decision-making processes in Medicine, Financial Services and other industries where the wrong decision may result in serious injury or death or cause an economic crisis, impacting multiple countries in a global economy.

## New Landscape of Threat Modeling and Security Engineering for AI

Traditional software attack methods and vectors

are still very critical, but they do not provide sufficient coverage in the AI/ML threat landscape. The security industry must avoid fighting next-gen issues with last-gen solutions, by building new frameworks and adopting new data-driven approaches, which address gaps in the design and operation of AI/ML-based services. The science of Big Data Analytics and Behavioral Modeling have evolved sufficiently to help us effectively address these issues. Developers of AI systems will always need to ensure the confidentiality, integrity and availability of sensitive data, that the AI system is free of known vulnerabilities, and provide controls for the protection, detection and response to malicious behavior against the system or the user's data.

The traditional ways of defending against malicious attacks do not provide the same coverage in this new paradigm, where voice/video/image-based attacks can circumvent current filters and defenses. New threat modeling aspects must be explored in order to prevent new abuses from exploiting our AI. This goes far beyond identifying traditional attack surfaces via fuzzing or input manipulation. It also requires incorporating scenarios unique to the AI/ML space. Key among these are AI user experiences such as voice, video and gestures. The threats associated with these experiences have not been traditionally modeled. For example, video content is now being tailored to induce physical effects. Additionally, research has demonstrated that audio-based attack commands can be crafted very easily.

To address these issues, any AI system should have some core capabilities. We discuss a few of them here in this article.

1. AI systems should be able to identify abnormal behaviors and prevent manipulation or coercion outside of normal boundaries of acceptable behavior in relation to the AI system and the specific tasks being automated.



Systems should be designed to resist inputs that would otherwise conflict with local laws, ethics and values held by the community and its creators. This means providing AI with the capability to determine when an interaction is going in the wrong direction.

2. This could be achieved by leveraging User and Entity Behavioral Analytics. Here are some methods to model entity behaviors that could help AI systems to get safer.
  - i. Pinpoint individual users who deviate from norms set by the various large clusters of similar users; e.g., users who seem to type too fast, respond too fast, or trigger parts of the system other users do not.
  - ii. Identify patterns of behavior that are known to be indicators of malicious intent probing attacks and trigger the start of MITRE's Network Intrusion Kill Chain.
  - iii. Recognize any time when multiple users act in a coordinated fashion; e.g., multiple users all issuing the same unexplainable yet deliberately crafted query, sudden spikes in the number of users or sudden spikes in activation of specific parts of an AI system.
3. AI should be a responsible and trustworthy custodian of any information it has access to. As humans, we will undoubtedly assign a certain level of trust in our AI relationships. At some point, these agents will talk to other agents or other humans on our behalf. We must be able to trust that an AI system has enough discretion to only share in a restricted form what it needs to share about us so other agents can complete tasks on its behalf. Furthermore, multiple agents interacting with personal data on our behalf should not each need global access to it. Any data access scenarios involving multiple AIs or bot

agents should limit the lifetime of access to the minimum extent required. Users should also be able to deny data and reject the authentication of agents from specific corporations or locales just as web browsers allow site blacklisting today. Solving this problem requires new thinking on inter-agent authentication and data access privileges like the cloud-based user authentication investments made in the early years of cloud computing. To tackle this issue, new security stacks/solutions will need to be designed for AI-specific applications in the areas of Authentication, Separation of Duty, Input Validation and Denial of Service mitigation.

"AI should be a responsible and trustworthy"

4. AI must be able to recognize bias in others without being biased on its own. While AI should be fair and inclusive without discriminating against any particular group of individuals or valid outcomes, it needs to have an innate understanding of bias to achieve this. AI should also be able to recognize bias in datasets it trains on. This could be cultural or regional, containing the vernacular in use by a particular group of people, or topics/viewpoints of specific interest to one group. As with maliciously-introduced training data, AI must be resilient to the effects of this data on its own inferences and deductions. Just as defense-in-depth practices are used to layer protections on top of a traditional Web Service API frontend, multiple layers of protec-

tion should be leveraged in bias recognition and avoidance techniques.

5. Machine Learning Algorithms must be capable of discerning maliciously-introduced data from benign events. Numerous papers have been published on the theoretical potential of ML model/classifier tampering and extraction/theft from services where attackers have access to both the training data set and an informed understanding of the model in use. The over-arching issue here is that all ML classifiers can be tricked by an attacker who has control over training set data. Attackers don't even need the ability to modify existing training set data, they just need to be able to add to it and have their inputs become "trusted" over time through the ML classifier's inability to discern malicious data from genuine anomalous data. This is of particular concern where unsupervised learning algorithms are training on un-curated or un-trusted datasets. This means that attackers can introduce any data they want provided the format is valid and the algorithm is trained on it, effectively trusting that data point equally with the rest of the training set. With enough crafted inputs from the attacker, the training algorithm loses the ability to discern noise and anomalies from high-confidence data. ML Classifiers and their underlying algorithms could be hardened and capable of detecting malicious training data without it contaminating valid training data currently in use or skewing the results.
6. AI must have built-in auditing and security logging to provide transparency and accountability. As we look ahead, AI will be capable of acting in a professional capacity as an agent on our behalf, assisting us with high-impact decisions. An example of this could be an AI that assists in the processing

of financial transactions. If that AI application were exploited, and transactions manipulated in some way, the consequences could range from the individual to the entire network. In high-value scenarios, AI will need appropriate audit and security logging to provide integrity, transparency, accountability, and in some instances, evidence where civil or criminal liability may arise. Critical AI applications and cloud services will need auditing/event-tracing capabilities at the algorithm level whereby developers can examine the recorded state of specific classifiers which may have led to an inaccurate decision. This capability is needed industry-wide in order to prove the correctness and transparency of AI-generated decisions whenever called into question.

7. AI must safeguard sensitive information, even if humans don't. Rich experiences require rich data. Humans already volunteer vast amounts of data for ML to train against. This ranges from the mundane video streaming queue contents to trends in credit card purchases/transaction histories used to detect fraud. AI should have an ingrained sense of discretion when it comes to handling user data, always acting to protect it even when it is volunteered freely by an over-sharing public.

## Conclusion

The future is not as bleak as it sounds. AI and ML can help transform the way we live and from that perspective, I am very confident, our future is very bright. The productivity of the human generation required continuous learning, and adoption of the specific Japanese Zen concept, where one learns to do better what one already does well. The machines are no different in this context. The machines will be learning for a long

time to come. As Abigail Adams once said, Learning is not attained by chance, it must be sought for with ardor and diligence. Machine Learning will follow a similar path of ardor and diligence. It simply is not good enough to “get AI right” from a security perspective—the world has to get it right. We need broad industry alignment and collaboration, with greater visibility brought to these issues and accountability for delivering the right solutions in any industry or vertical. Only then can we begin guiding our customers and consumers down a path, where AI is truly democratized, and augments the intelligence of all humanity.

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# Service

## Sewa International: Helping the World, Building a Better World

Dr. Sree Sreenath (IISc, ME-EE 1980-1982)

President, Sewa International, USA

Sewa International is a Hindu faith-based, humanitarian, nonprofit service organization. Founded in 2003, Sewa International is part of a larger movement that started in India in 1989 and is active in twenty countries. Sewa serves humanity irrespective of race, color, religion, gender or nationality.

Sewa International specializes in disaster relief and rehabilitation, and their development programs focus on family services; child, tribal and refugee welfare; women's empowerment; health; and education. In addition to their work in the United States, Sewa has undertaken development projects in Colombia, Guyana, India, Kenya, Pakistan and Sri Lanka.

There are many faith-based humanitarian organizations around the world, but few who identify themselves as a Hindu faith-based organization. Sewa therefore aspires to be the pre-eminent, Hindu faith-based humanitarian organization that serves selflessly and with compassion to create a positive impact around the world. Sewa envisions and strives for a world in which all people live in harmony, free from suffering.

Sewa International's mission is to serve humanity in distress, aid local communities, run developmental projects for the underserved, and assist

people in transformational change through the power of innovation by mobilizing partners, donors, and volunteers. Sewa accomplishes its mission focusing on:

- Disaster recovery
- Family and child welfare
- Volunteerism

" Sewa International's mission is to serve humanity in distress, aid local communities, run developmental projects for the underserved,"

Sewa is built on the universal, dharmic principles of "Serving Humanity is Serving Divinity," and that there is "Unity in Diversity." The principles that guide Sewa volunteers around the world include the following:

- Service above self
- Practicing teamwork and self-reliance
- Being proactive and responsive to the needs of society while promoting ‘Self Reliance’ among those who are served
- Emphasizing pluralism, trustworthiness, and transparency
- Creating a positive impact through operational excellence and customer satisfaction
- Respecting and safeguarding the environment
- Valuing volunteers, donors and partners
- Respecting the dignity of every human being, consider humanity as one family (vasudhaiva kutumbakam) while serving all regardless of race, color, religion, nationality, gender, and sexual orientation.
- Accepting and celebrating diversity in people and community, and be sensitive to the cultural backgrounds of people who are served.

For example, in 2018, natural and manmade disasters affected many in the world, and Sewa International volunteers stepped in to help those that were affected by the floods in Kerala, India, in August 2018, and with the devastating Camp Fire of November 2018, in Butte County, CA. The floods in Kerala inundated and devastated seven of the 14 districts in the state, killing 500 people, and forcing the evacuation of a million people. Within days, Sewa swung into action and established rescue protocols with its sister organizations in India. Sewa established a 24/7 hotline (phone and social media lines) managed by volunteers from across Sewa chapters in the US.

In the aftermath of Hurricane Harvey (August 2017), Sewa helped 1,600 victims rebuild their life through a 9-month case management grant from the Greater Houston Community Founda-

tion. Sewa exceeded the committed goals in the grant by 250% through careful project management and leveraging volunteer time donations. In post-Harvey rehabilitation work, Sewa volunteers clocked more than 20,000 hours to help people re-establish their roots in a land ravaged by floods. Sewa International raised \$3.5 million donations in cash and kind for Hurricane Harvey recovery efforts, of which 83% of the funds have already been deployed. Counting Sewa’s volunteer hours monetized per IRS voluntary hour guidelines, would translate into an additional \$2 million contribution. In mid-2018, the American Red Cross awarded a \$500,000 grant to Sewa to rebuild 11 completely destroyed homes in the “Laotian-Cambodian” immigrant community in Rosharon, TX.

**Sewa is built on the universal, dharmic principles of “Serving Humanity is Serving Divinity,” and that there is “Unity in Diversity.”**

Sewa’s Family Services program provides a support structure for the community to help families in emergency situations. Sewa works with the community to help facilitate people in need, providing information, professional and monetary support, and, volunteer-based help. The main areas are Awareness Workshops for community benefit and Case Management Services.

Sewa’s ASPIRE (Achieving Student Progress, Instilling Resilience and Excellence) program provides an after-school tutoring and mentoring services primarily for underprivileged youth in

three metro areas of the USA. Started in Houston, TX, in 2012, this has been extended to Atlanta, GA; Cleveland, OH; and Dallas, TX. Sewa's mission is to empower communities by creating resources and providing skills needed to enhance their lives. The goal is on the holistic development of the children, nurturing in them with knowledge and qualities required for social and academic success, such as emotional intelligence, competence in core subjects, critical thinking, and creativity.

Sewa works with the Bhutanese community whose people started arriving in the US from 2008 as legal refugees. Most of them currently reside in a cluster of 12 US cities, numbering about 70,000 people. Sewa is implementing Bhutanese empowerment programs in five US cities: Atlanta, Boston, Columbus (OH), Cleveland, and Dallas. To increase youth self-esteem, Sewa has developed a program to increase cultural pride and self-identity through Nepali language and culture classes; provide SAT training for the college bound students; provide leadership training opportunities through the Sewa's Get Inspired program and sports clubs. Sewa works toward these goals by involving the Bhutanese community organizations and local school systems to increase parental involvement in children's education, and, by organizing youth camps.

Sewa's Get Inspired program is an annual summer internship program offered to young adults and college students to enhance their leadership and professional skills. Interns learn diverse professional skills and practice these skills in Sewa's community projects. This internship is a full-time, 8-10 week commitment composed of direct community service, marketing communication, event planning, tutoring, leadership training, and public outreach. Five Sewa chapters offer this internship program, and 51 students have participated in this internship program already.

LEAD is Sewa International's Summer Internship Program for High School students. Lead introduces socially conscious leadership to young adults. The interns commit to a minimum 50 hours of service a year, including direct service in volunteer events. Interns get the opportunity to listen to lectures by community leaders from a variety of fields.

Sewa's Sponsor a Child (SaC) program serves children from low income families in India, Nepal, and Colombia. The assistance provided in this program covers school fees, uniforms, books, career guidance, and counseling. Most beneficiary children come from families of the invisible poor (maidservants, auto/ taxi drivers, day laborers, construction workers, vegetable vendors, artisans, farmers, police constables, slum dwellers, etc.). Supported by monthly contribution of \$20/child by its donors, Sewa served 1,443 children in 2018 under this program.

Sewa Volunteers work to construct toilets in schools and colleges in the states of Uttar Pradesh, Madhya Pradesh, and Karnataka in India. In 2018, Sewa and its partner organizations built 119 toilets benefiting over 8,000 children. Taking its Health and Hygiene Project to the next level, Sewa distributed eco-friendly silicone menstrual cups and cloth napkins in many schools. As part of the program, potable water supply and maintenance work was also undertaken in many places. Sewa team members visited many schools and colleges in India to observe the progress being made, and to spread awareness about health and hygiene among young girls.

These and other programs, including the plan of building 100 schools in Northeast India, serving the underserved region and its people, constitute the work of Sewa International.

For more about Sewa International, please visit: <https://www.sewausa.org/>

# STEM

## STEMPeers™

### Driven by Altruism, Powered by STEM

Abhinav Dey (IISc, PhD, 2011)

Cofounder, STEMPeers.org; Lead Scientist, Microcures Inc., New York

The PhD Career Support Group (stempeers.org), popularly known as CSG among the worldwide STEM community, was initially born out of a necessity to help large numbers PhDs who were coming out from the Indian Institute of Science to enable career sustainability in a new country. Embarking on a career path in a foreign land brings with itself new opportunities along with new hardships, which either we are unaware of or don't have the skills or knowledge to work our way through. Ever since its inception on July 22nd (2015) this group has grown in its membership from 40 on day one to over 13,000 as of today.

Why did we have a forum like this to begin with? While being on the 400 acres of lush green campus of IISc, we had the best of resources and the best of network in academia. However, the story changed for many when it was time to fly out of the cozy IISc nest. Life in the western hemisphere brought in exposure. This exposure was not only in advanced training in their respective fields, but it was also in the form of knowledge about the different ways in which their peers were utilizing their scientific training to create unique niche beyond the traditional academic scenarios.

Not that IISc didn't have its stellar alumni in these STEM careers beyond academia, but both Anan-

da and I observed that during their PhD training at IISc there was

- A lack of positive encouragement for students to seek out mentorship or internships that enable them to be prepared towards a rapidly changing world of STEM careers.
- Complete lack of knowledge at the university level of global employability trends of science PhDs,
- Disconnect with the reality of academic tenure-track jobs
- Complete lack of Science PhD alumni network.

On digging deeper, we realized that the problem was more associated with the minimal levels of awareness in the IISc student community about the applicability and viability of their skills in the multitude of STEM careers.

The first six months of CSG was majorly dedicated to intelligent discussions and debates over careers, science, creative thoughts, and above all seeking advice on immigration issues. Ananda and I had several helping hands, well wishers and sounding boards who realized the potential of this forum and gave us valuable input on how

to move this initiative forward. Until then this forum was primarily dominated by the presence of IISc'ians. However, just as the smell of good food doesn't stay contained within the confines of a house, the news about the usefulness of CSG spread across the boundaries of IIScian circles. We were approached by several individuals to open the forum to admit early-career STEM professionals seeking guidance and willing to give back with their knowledge, altruistically.

"Embarking on a career path in a foreign land brings with itself new opportunities along with new hardships."

The voluminous amount of career-based discussions that happened on a daily basis in CSG, led us to realize that as a career advancement forum we should begin an initiative that brings out these inspirational stories of the humans of Science. That was the birth of our blogging platform, Club SciWri. This platform (created on January 5th, 2016) was not only a blogging platform, it was the first step of CSG outside the realms of Facebook. With time we increased our number of followers and authors, which was solely due to the passion that CSG members had in communicating their science and stories associated with that. As of today, we have had more than 100 authors who have authored more than 400 blogs and gener-

ated more than 200,000 visitors to this website. The best part which is beyond these numbers are the career transitions that Club SciWri enabled. Some of our editors have successfully manoeuvred their careers from a bench scientist's role to the editorial bench of publishing houses like Nature and Cell, while others have moved to crucial positions in science administration (in India and US). In addition, our illustrators moved up the ladder of recognition and created their own brands, like IpsaWonders and Fuzzy Synapse, which are creating phenomenal examples of science communication-based entrepreneurship.

The initial success of CSG's blog ClubSciWri during the first-half of 2016, especially with respect to career development stories, led us to realize the importance of mentorship needed to groom the multitude of CSG members who started getting inspired and move-on to their career transition phase. This idea gave rise to CSG's flagship social media-based mentoring platform, Gurukool (the word originates from "Gurukula" in Sanskrit, which means a residential schooling system) where the "shisya" or the students live with the "Guru" or mentor establishing a sacred "Guru-Shishya" or mentor-mentee relationship. The group helps with resumes, cover letters, LinkedIn tailoring, and provides one-on-one advice/mentoring with PhDs who have successfully transitioned to STEM careers. This also includes suggestions on contracts, negotiation skills, interview skills, and post job mentoring. Our first mentee was another IIScian, Dr Satarupa Das, who shared her story in Club SciWri (<https://www.sciwri.club/archives/1286>) and showed that the experiment of peer-sourced mentoring through social media for career development is a viable alternative to traditional career development approach utilized in universities across the world. The Gurukool program has been successfully running for more than two years now and has helped more than 200 CSG members in their



career transition to multiple organizations of Big Pharma to small startups.

With so much happening in the virtual world, a major step forward came with the help of fellow IIScians, Dr Syam Anand and Dr Nikhil Gupta. Thanks to their efforts and guidance CSG obtained a non-profit designation within two years of its launch in 2017. With this, CSG became an official entity in the US and, what began as a social media campaign was now a real-world organiza-

tion, we were successful in fundraising through sponsorships and registration fee to organize our first ever international conference, STEMPeers, in Boston on August 25th (2017). We had an exciting experience organizing STEMPeers in 2017 with the help of Dr Syam Anand and Dr Ranjith Anand. Over 120 participants and numerous panels on diverse STEM careers, including a plenary talk by Addgene's co-founder, Melina Fan made the event a huge success.

**"We have ensured that the panelists and speakers at each STEMPeers symposium are from multicultural backgrounds and we believe that participating STEM graduates will be inspired to learn from these diverse personalities."**

tion. This event opened up our doors to collaborate, partner and reach out to several companies/organizations/agencies/individuals. The first step to the real world interaction between CSG members began soon after. As a non-profit organiza-

The success of the Boston STEM Peers, encouraged our European CSG members to organize their first EuroSTEMPeers meeting at Brno (Czech Republic), the birthplace of the Gregor Mendel (Father of Genetics) in April, 2018.



Participants at the recently concluded EuroSTEMPeers 2019 meeting at Berlin.

These two major conferences set the stage for annual CSG meetings in the US and Europe. The subsequent meetings were held at New York City (STEMPeers-2018) and Berlin (EuroSTEM-Peers-2019). The second editions were larger in participation and partnerships where CSG collaborated with many student run organizations like INetNYC and SPARK Berlin (an international academic entrepreneurship incubator program). These meetings were not only a meeting of minds, but also a showcase of CSG's organic growth that has always been driven by the concept of diversity and inclusion. At every STEMPeers event, we have made sure that women in Science and multiple ethnicities get their due representation. We have ensured that the panelists and speakers at each STEMPeers symposium are from multicultural backgrounds and we believe that participating STEM graduates will be inspired to learn from these diverse personalities. Our newest sci-comm platform, The Science Times, on Instagram came about through a confluence of brilliant scientists who brainstormed at STEMPeers event and subsequently in the CSG forum. The success of our diverse team of sci-commers in Instagram was re-

sounding; within a short period of one year they have a worldwide fan-following of more than 8000. This initiative of CSG not only created a visual delight of STEM for the science-fans of all ages but showed the world that when science is conveyed the right way, everyone can have access to it.

As we gear-up for our third round of crowd-sourced fundraising, we are proud to initiate STEMPeers™ Fellows Program aiming to financially assist early career STEM professionals to attend conferences and get a boost in their career development efforts. We would like to emphasize that it is the power of altruism that created CSG, fuels CSG and keeps the beacon of hope alive for many early-career scientists. We look forward to support from every corner of the world and every individual reading this story. We believe that this group of brilliant STEM professionals has it in them to change the world for the better, provided we make every effort to make sure they get their rightful place to sustain a livelihood in today's society.

# Transformation

## The 5G Network Transformation

Sujata Tibrewala (IISc, ME(I) EE 1996-2000)

Community Development Manager, Intel

### Overview

Internet traffic has undergone tremendous growth over the years and shows no signs of slowing down. For example, in *Staying Connected in 2017: Our Predictions*, AT&T\* reports that the traffic on their network has grown 250,000 percent since 2007. People are adding new devices to their homes, and new data-hungry applications are being developed for work, connectivity, entertainment, gaming and more. In addition to the amount of data required, many applications are also latency-sensitive. This means networks have to handle large volumes of data faster than ever, and without added cost to the end user or subscriber.

### Enter 5G

With 5G, a user will be able to download a

high-definition video in under a second (a task that could take up to 10 minutes on 4G LTE). 5G networks will boost the development of other new technologies, such as autonomous vehicles, virtual reality, smart agriculture, remote emergency and medical services, and the Internet of Things (IoT).

In addition to being a dramatically better mobile broadband system, 5G is an innovation platform for services, applications, and connected devices.

### Connecting the World

According to *Introducing OpenCellular: An open source wireless access platform*, at the end of 2015 approximately half the world's population did not have internet access. The OpenCellular Project, founded by Facebook\*, is designed to support a range of communication options,



Figure 1. 5G is critical to a new data economy.

from a network in a box to an access point supporting everything from 2G to LTE. Facebook plans to open-source the hardware design, along with necessary firmware and control software, to enable telecom operators, entrepreneurs, OEMs, and researchers to locally build, implement, deploy, and operate wireless infrastructure based on this platform.

This project empowers the developer community to contribute to the goal of getting to 100 percent connectivity in 5G. To be successful, new 5G

time. The associated leap in performance can deliver fiber-like speeds, without the wires.

### Small cells

Millimeter waves cannot travel through buildings and they can be absorbed by plants and rain. This is why the current technology of big base stations broadcasting their signals over long distances will not work in 5G. To solve this problem, 5G will use thousands of low-powered mini base stations.

## “5G is a fundamentally different technology.”

technology must be designed to connect with legacy 2G, 3G, 4G LTE, Wi-Fi\* and wired networks. Implementing the new generation networks in this way also means operational efficiency for the whole network and will benefit the operator bring down the cost for even existing users allowing them to remain competitive and hence grow.

### The Pillars of 5G Wireless Technology

Everything You Need to Know About 5G, by Amy Nordrum, Kristen Clark and IEEE Spectrum\* Staff.

The five pillars below are the foundation of 5G technology.

#### Millimeter wave

Current networks use the 3 kHz to 6 GHz spectrum, which is getting crowded due to the explosion of data from smart phones and other connected devices. Next-generation technologies will use the 30-300 GHz spectrum, known as millimeter wave or mmWave, available for mobile broadband communications for the first

#### Massive MIMO

Advanced multiple input multiple output (MIMO) antenna technology, including adaptive analog beamforming and beam tracking/steering techniques, can increase data rate, coverage, and capacity at base stations and within devices.

#### Beamforming

It's like a traffic signaling system for cellular signals, allowing data to be sent by the base station to a specific user, instead of broadcasting in all directions, hoping the user will receive it. This precision prevents interference and is much more efficient than the current technology, enabling base stations to handle a larger number of incoming and outgoing data streams simultaneously. The base station uses the direction of the source stream to calculate where the user device is located and determine where to send the stream.

#### Full duplex

Today's base station transceivers can't simul-

taneously send and receive signals on the same frequency. 5G transceivers support full duplex transmissions, which enable send and receive

layer need to work at a much higher speed, support greater bandwidth, and be backward-compatible.

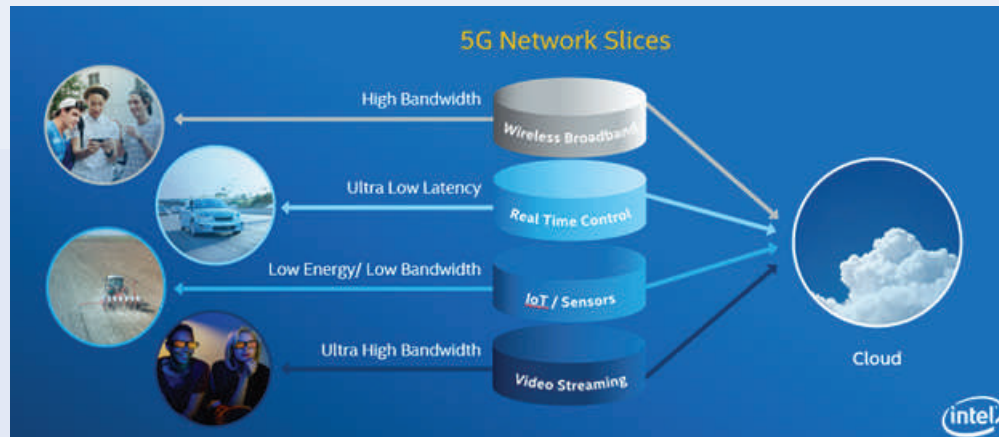


Figure 2. Matching cloud services to diverse delivery needs.

of same frequency signals at the same time. An alternate solution is to time division the signal, meaning send the incoming and outgoing data at the same frequency interleaved in a known pattern so the receiving base station can differentiate between the two. Researchers have designed high speed silicon transistor switches to halt the backward roll of these switches so both signals can be sent at the same time, improving the spectral efficiency of the signals

### 5G and Network Transformation

The previous sections illustrate how 5G is a fundamentally different technology in terms of how the physical layer of the technology works, how it interacts with legacy technologies, and the use cases themselves. Now let us talk about the requirements and challenges of 5G and how they can be addressed by various network elements.

#### Challenge 1

Network hardware elements (user equipment, modems, antennas, etc.) operating at the physical

#### Solution 1

The 5G standard has been defined such that, other than the physical layer, it is backward-compatible. Though the actual bits and bytes travel on different frequency bands and need different modems, the upper-layer protocols do not change much. For this reason, most of the 5G software stack remains unchanged; however, it does need to support higher bandwidth and speeds, a challenge that will be met by a combination of software and hardware architecture designs.

#### Challenge 2

Network elements must be scalable and agile so that services can be brought up and down fast, as required by user-generated demand.

#### Solution 2

Software-Defined Networking (SDN) and Network Function Virtualization (NFV) will play a key role, since these technologies will enable network functions to be modularized and to run

commodity-based servers. These servers, sitting in service providers' data centers and at the edge, can spin network services up and down on-the-go to meet user demands.

- Virtual network functions (VNFs) hosted in containers and micro services will help reduce the footprint of network services. Compared to VM-based virtual network functions, they cost less to operate and are faster to bring up and down. Security concerns related to containerization can be addressed by using secure Kata containers as required by the network.
- Orchestration frameworks will play a critical role, since automation and interworking of network functions across industries and vendors will be the key to scale a 5G network. Various open source projects like OpenStack\*, OPNFV\*, ONAP\*, and Open Baton\* are working in this direction.

### Challenge 3

Networks need to be flexible without compromising on throughput and bandwidth requirements. Different use cases need to be optimized for different network service level agreements (SLAs). For example, use cases like automated driving and remote medicine are extremely latency-sensitive, while applications like gaming, augmented reality (AR), and virtual reality (VR) demand high bandwidth and low latency. A smart agricultural application has massive bandwidth demand due to scale but is not latency-sensitive. If these different scenarios are to be serviced by the same network, the network must classify the packets as belonging to a particular group, or network slice, and process them according to a set of rules. This requires extensive traffic classification and scheduling to implement all the network nodes through which the traffic passes. This implemen-

tation needs to be flexible enough so traffic classes and slices can be defined dynamically and not be tied to what has been preprogrammed in the hardware.

Service assurance: 5G's stringent requirements leave no room for error in terms of how network service classes are handled. If a service class (see Figure 2 for the different service classes) is guaranteed to meet an SLA that requires sub-microsecond latency, the underlying network infrastructure has to reserve resources to make that happen. It is vital to monitor systems for utilization and malfunctions, in order to prevent service disruptions or to facilitate the prompt resumption of normal service. Today, monitoring and management activities throughout the network are supported by discrete systems in fixed service chains with tightly integrated hardware and software products as well as established management frameworks and assurance tools. In a virtualized environment based on NFV, these activities are more challenging as a result of the disaggregation of hardware and software and the ability to deploy services dynamically.

### Solution 3

Using a well-designed software stack for the core and edge – supported by hardware designed to have the flexibility needed to enable traffic to be classified, sliced, and monitored – is the best way to transform networks and make them ready for 5G. One of the biggest challenges in the networking industry for moving to a more software-based solution has been the fact that these networks have to support legacy devices and be backward-compatible. With 5G, new networks are being deployed, creating the opportunity for a flexible and agile green field deployment.




# EXTEND THE CLOUD TO THE EDGE

An innovative platform for services, applications, and connected devices, 5G networking offers many improvements over 4G wireless networks.

Intel technology is the foundation for your 5G software-defined infrastructure.

**Learn more:**

<https://software.intel.com/en-us/networking/5g>



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# Conference guide

Program

Speakers

Cultural Program

Artists



# Program

Friday, June 21, 2019

12:30 PM – 5:00 PM	On-site Registration <i>Foyer</i>	
1:00 PM – 2:00 PM	Ms. Anjali Subbarao - LinkedIn Profiles for Your Careers <i>Mediterranean 1</i>	
2:00 PM – 2:30 PM	Prof. Sargur Srihari Artificial Intelligence <i>Mediterranean 1</i>	Prof. Rajesh Nair Creating 10x Entrepreneurs in Under-Served Communities <i>Mediterranean 2</i>
2:30 PM – 3:00PM		Mr. Prabhakar Sunderrajan - An Entrepreneur's Journey <i>Mediterranean 2</i>
3:00 PM – 3:15 PM	Break	
3:15 PM – 4:15 PM	Dr. Ananda Ghosh Peer Mentoring as a tool to excel as a Community-What CSG taught me <i>Mediterranean 1</i>	Ms. Vandana Tilak Fundraising for NGOs <i>Mediterranean 2</i>
4:15 PM – 5:00 PM	Mixer / Divisional Get-Togethers / Batch Re-Unions <i>Foyer and Outdoor Patio</i>	
5:00 PM – 5:20 PM	IISc AANA Co-Chairs – Welcome Speech & AANA Goals Dr. Murthy Gudipati, Prof. Meena Rao <i>Mediterranean Ballroom</i>	
5:20 PM - 5:50 PM	Invited Talk: Prof. Rao Tummala Beyond Moore's Law <i>Mediterranean Ballroom</i>	
6:00 PM – 7:00 PM	Dinner, along with Invited Talk 6:30-7:00PM - Alumni Outreach – Public Private Partnership: Prof. S. Mohan <i>Mediterranean Ballroom</i>	
7:00 PM – 7:45 PM	IISc Director's Address – IISc Vision: Prof. Anurag Kumar <i>Mediterranean Ballroom</i>	
7:45 PM – 9:00 PM	Cultural Program <i>Mediterranean Ballroom</i>	

# Program

Saturday, June 22, 2019

7:00 AM – 8:00 AM	Breakfast On-Site Registration (8am-12noon) <i>Foyer</i>		
8:00 AM – 8:30AM	Conference Opening address <i>Mediterranean Ballroom</i>		
8:30 AM – 9:15 AM	Plenary Session 1 – Imagining a better world Prof. Brian Kobilka <i>Mediterranean Ballroom</i>		
9:15 AM – 9:45 AM	Break		
	Track 1: Biomedical Science & Technology <i>Mediterranean 1</i>	Track 2: Space Technology <i>Mediterranean 3</i>	Track 6 – AI and Next Generation Computing <i>Cyprus</i>
9:45 AM – 10:15 AM	Invited Talk Dr. Walter Moos	Invited Talk	Invited Talk Prof. Y Narahari
10:15 AM – 10:45 AM	Invited Talk Prof. G K Ananthasuresh	Invited Talk Dr. Penelope Boston	Invited Talk Mr. George Brody
10:45 AM – 11:30 AM	Panel Discussion Dr. Yash Vaishnav, Dr Ravi Kiron, Dr. David Coolier, Mr. Fred Dorey and Mr. Erik Wiberg	Panel Discussion Dr. DV Giri, Prof. Yahya Rahmat- Samii, Dr. Goutam Chattopadhyay	Invited Talk Mr. Raja Koduri
11:30 AM – 1:00 PM	LUNCH 11:30AM-1:00PM <i>Outdoor Patio</i>		
1:00 PM – 1:45 PM	Plenary Session 2 – Experience of a better world Dr. Eugene Tu <i>Mediterranean Ballroom</i>		
1:45 PM – 2:30 PM	Plenary Session 3 – Designing a better world: Reflections on Six Decades of Interactions with the IISc Prof. Thomas Kailath <i>Mediterranean Ballroom</i>		
2:30 PM – 3:00 PM	Break		

# Program

Saturday, June 22, 2019 (Continued)

	Track 3: Social Entrepreneurship <i>Mediterranean 1</i>	Track 4: Security and Data Privacy <i>Mediterranean 3</i>	Track 5: Agricultural Technology <i>Cyprus</i>
3:00 PM – 3:30 PM	Invited Talk Prof. Sree Sreenath	Invited Talk Dr. Prakriteswar Santikary	Invited Talk Dr. Ganesh Kishore
3:30 PM – 4:00 PM	Invited Talk Sri Chanchalapati Dasa	Invited Talk Mr. Madhukar Govindaraju	Invited Talk Prof. Sekhar Boddupalli
4:00 PM – 4:45 PM	Panel Discussion on track 3 Mr. Poshit Nag, Dr. Gaj Birur, Dr. Eri Srivatsan	Panel Discussion on track 4 Mr Prabakar Sundarrajan, Mr. Anil Agarwal, Mr. Anand Athreya, Mr. Kumar Narayanan	Panel Discussion on track 5 Dr. Ganesh Kishore, Mr. Sumer Johal, Mr. Amit Sridharan, Prof Sekhar Boddupalli
4:45 PM – 6:00 PM	Mixer		
6:00 PM – 7:45 PM	Dinner <i>Mediterranean Ballroom</i>		
6:30 PM – 7:00 PM	Invited Talk Information Technology Research Academy: An Opportunity to Engage with Indian R&D and Startups Prof. Narendra Ahuja <i>Mediterranean Ballroom</i>		
7:00 PM – 7:30 PM	Invited Talk Prof. Rohini Godbole <i>Mediterranean Ballroom</i>		
7:45 PM – 9:30 PM	Cultural Program Confluence: Science and Spirituality presented through Music Madhuvanti Bhide and team <i>Mediterranean Ballroom</i>		

# Program

Sunday, June 23, 2019

7:00 AM – 8:00 AM	Breakfast / Registration <i>Foyer</i>		
8:00 – 8:45 AM	Plenary Session 4 – Fostering innovation for a better world Dr. Om Nalamasu <i>Mediterranean Ballroom</i>		
8:45 AM – 9:00 AM	Break		
	Track 7: Environment & Renewable Energy <i>Mediterranean 1</i>	Track 8: Human Wellbeing <i>Mediterranean 3</i>	Track 9: 5G and Edge Computing <i>Cyprus</i>
9:00 AM – 9:30 AM	Invited Talk Prof. G K Surya Prakash	Invited Talk Dr. Cesar Molina	Invited Talk Mr. Bob Monkman
9:30 AM – 10:00 AM	Invited Talk Dr. Shuli Goodman	Invited Talk Prof. Lata Palaniappan	Invited Talk Mr. Vasuki Narasimha Swamy
10:00 AM – 10:45 AM	Panel Discussion on Track 7 Dr. Sudhir Kshirsagar, Prof. Pradip Dutta	Fireside Chat Ms. Nandini Ramani, Mr. Sriram Viswanathan	Panel Discussion on Track 9 Ms. Sujata Tibrewala, Mr. Bin Hu, Mr. Prakash Ramchandran, Dr. Malini Bhandaru
10:45 AM – 11:00 AM	Break		
11:00 AM – 11:20 AM	Invited Talk Prof. Sundari Cheryl Dembe A 48-year Ph. D. Pathway: Secrets to Success in Attaining One's Goals <i>Mediterranean Ballroom</i>		
11:20 AM – 11:45 AM	Invited Talk Prof. Manjula Waldron Daring Greatly: First Indian woman's Si Valley Tech Odyssey to and from IISc <i>Mediterranean Ballroom</i>		
11:45 AM – 12:15 PM	Closing Remarks IISc AANA Co-Chairs & IISc Director + BOXED LUNCH <i>Mediterranean Ballroom</i>		

# Speakers

## Dr. Anil K. Aggarwal

Founder, AMCOMP Corporation

*Dr. Anil K. Aggarwal*, Founder and former President of AMCOMP Corporation, has made pioneering contribution to the development of GPS Technology. AMCOMP not only provides technical and engineering services to DoD, Government and other commercial organizations, but is also responsible for GPS systems integration, data processing and analysis and computer simulation support across all Air Force platforms.



Dr. Aggarwal is a founder and a member of the Board of Directors at TopVue Defense Inc. which provides support for military acquisition programs and Data Management. He has also held senior management positions at Magnavox and Texas Instruments where he led various efforts in GPS Development and applications for Ballistic Missile Defense program.

Dr. Aggarwal received a ME degree in Aeronautical Engineering from IISc, a Ph.D. in Mechanical and Aerospace Engineering from Rice University and completed the Executive Development programs from Santa Clara University and Tuck School of Management at Dartmouth. In 2019, Dr. Aggarwal was elected to Life Senior Member of IEEE.

## Dr. Narendra Ahuja

Research Professor, Electrical and Computer Engineering,  
Beckmann Institute

*Professor Narendra Ahuja* is Research Professor in Dept. of Electrical and Computer Engineering, Beckman Institute, and Coordinated Science Laboratory, University of Illinois at Urbana-Champaign and Founding Director of Information Technology Research Academy, Gov't of India. He received B.E. in electronics engineering from BITS, Pilani, M.E. in electrical communication engineering from IISc, and Ph.D. in computer science from University of Maryland, College Park. He was Donald Biggar Willet Professor of Engineering at UIUC 1979-2012. He has served as Founding Director of International Institute of Information Technology, Hyderabad.



He has co-authored three books, 400 academic papers, and four patents, and supervised research of about 50 PhD, 15 MS, 100 undergraduate students and 10 Postdocs. His systems have been used by about a dozen companies/organizations, including General Electric, Lockheed and Honeywell. He is a fellow of IEEE, American Association for Artificial Intelligence, Association for Computing Machinery, American Association for the Advancement of Science, and International Society for Optical Engineering. He received IEEE's Emanuel R. Piore award, TA Stewart-Dyer/Frederick Harvey Trevithick Prize of Institution of Mechanical Engineers, and an Honorary Doctorate from York University, England (2018).

# Speakers

## Dr. G.K. Ananthasuresh

Professor, Mechanical Engineering, IISc

*Professor G.K. Ananthasuresh* (B. Tech. IIT-Madras, 1989; MS, U. Toledo, 1991; PhD, Michigan, 1994) is a Professor of Mechanical Engineering at IISc. His previous positions include post-doctoral associate at the Massachusetts Institute of Technology Associate Professor at the University of Pennsylvania, Philadelphia, USA; and visiting professorships in University of Cambridge, Katholieke Univesiteit, Leuven, Belgium; and IIT-Kanpur.



His current research interests include compliant mechanisms, kinematics, multi-disciplinary design optimization, microsystems technology, biomedical devices, and biomechanics of cells. He served on the editorial boards of ten journals and is a co-author of 100 journal papers and more than 175 conference papers as well as four edited books, one textbook, and 16 book-chapters. He has 13 patents, six granted and seven in process. He is Editor in Chief of the Journal of IISc. He is a recipient of the NSF Career Award and SAE Ralph O Teeter Educational Award in the USA and the Swarnajayanthi Fellowship, Shanti Swarup Bhatnagar Prize, Abdul Kalam Technology Innovation National Fellowship in India as well as 11 best paper awards in international and national conferences and 10 prizes in design contests that his students and he participated. He advised 19 PhD students and 36 master's students so far. His students have formed two start-up companies and his group's research has led to six products.

## Dr. Malini Bhandaru

Co-chair, Security Work Group, EdgeX Foundry

*Dr. Malini Bhandaru* leads open source IoT efforts at VMware, actively contributing to EdgeX Foundry, and serving as co-chair of its Security Work Group. Prior to VMware, during her decade long career at Intel, she worked on a big data research platform for autonomous driving, OpenStack for cloud infrastructure management, Open Daylight for software defined networking, speeding cryptography in OpenSSL, and architecting Xeon server power and performance features. She worked on IoT long before it was hot at a startup. She has over 10 granted patents, a Ph.D. in Machine Learning from the University of Massachusetts. She is a STEM and child advocacy volunteer. She enjoys gardening.



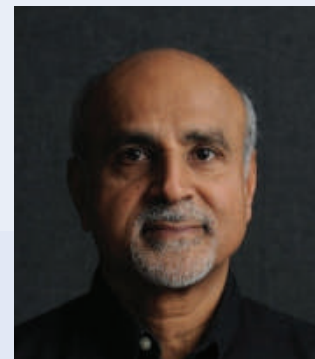
# Speakers

## Dr. Gajanana Birur

Principal Spacecraft Engineer, NASA Jet Propulsion Lab

*Gajanana (Gaj) Birur* is a Principal spacecraft engineer/technologist at NASA Jet Propulsion Laboratory in Pasadena, California. He has been with JPL since 1979, soon after receiving his Ph.D. in Mechanical Engineering. He has led teams at JPL that developed advanced spacecraft thermal technologies many of which have been implemented on NASA Mars rovers such as the Mars Pathfinder (1996) and the Mars rover 'Curiosity' (2011). He has been awarded the NASA's Exceptional Engineering Achievement Award and the NASA's Exceptional Service Award. He received his M.E. in Aeronautics from IISc in 1971.

In 2004 Gaj co-founded a Bangalore-based NGO that provides science educational outreach to underserved government primary school children in the rural areas around the town of Birur and in Bangalore in Karnataka. Gaj was a co-chair of the IISc Alumni Association of North America (2015-18) and the founding editor (2013) of the IISc AANA Newsletter.



## Dr. Sekhar Boddupalli

President, Ag Biotech Division at Intrexon Corp.

*Dr. Sekhar Boddupalli* is President of Ag Biotech Division at Intrexon Corporation. Prior to Intrexon, Dr. Boddupalli served as Global Consumer R&D lead for Monsanto Vegetable Seeds Division. In that capacity, he was responsible for conceptualization and launch of vegetables with consumer appeal. He holds several patents and publications and has held research faculty appointments in biochemistry at the UT Southwestern Medical Center in Dallas, Texas. He holds a Ph.D. in Biochemistry from IISc.



# Speakers

## Dr. Penelope Boston

Director, NASA Astrobiology Institute

*Dr. Penny Boston* is the Director of NASA's Astrobiology Institute (NAI), at NASA Ames, Moffett Field. She leads the NAI in fulfilling its mission to perform, support, and catalyze collaborative interdisciplinary astrobiology research; train the next generation of astrobiologists; provide scientific and technical leadership for astrobiology space mission investigations; and develop new information technology approaches for collaborations among widely distributed investigators.

Prior to joining NASA, Penny, in 2002, founded and directed the Cave and Karst Studies Program at New Mexico Tech, Socorro, New Mexico, where she also served as a professor and led their Earth and environmental sciences department as chair. She also served from 2002 to 2016 as associate director of the National Cave and Karst Research Institute, a congressionally mandated institute in Carlsbad, New Mexico. She holds Bachelor of Arts and Master of Science degrees and a Ph.D. from the University of Colorado Boulder.



## George Brody

Founder, InfoNet of Things LLC

*Dr. George* is currently the Founder and Managing Partner of InfoNet of Things LLC, an IoT solutions company, after retiring from a 43-year corporate career. He is also giving back to the community via initiatives such as TexChange and AWRC-NTX. Prior to that, he was Founder, President and CEO of GlobeRanger, later acquired by Fujitsu. Prior to co-founding GlobeRanger, Brody served as Vice President and General Manager of Nortel Networks' Wireless Network Solutions division, where he managed a series of start-ups. At Nortel, Brody was responsible for its global wireless product development programs and the management of the Bell Northern Research Labs in Richardson, a world-class research and development organization.

Brody holds a bachelor's degree in electrical engineering from IISc. He also earned master's degrees in electrical engineering and computer science from the University of New Brunswick. He is a member of the advisory council for the Jindal School of Management at the University of Texas at Dallas. Brody was also the Chairman of MobME Wireless Pvt Ltd, an exciting Wireless technology venture, based in Cochin, India. His current professional interests lie in the areas of entrepreneurship, angel investment and the creation of new ventures at the intersection of wireless technology with medical and enterprise applications involving IoT, 5G, AI as well as Augmented Reality/Virtual reality.





# Speakers

## Dr. Goutham Chattopadhyay

Senior Research Scientist, Jet Propulsion Laboratory

*Dr. Goutam Chattopadhyay* is a Senior Research Scientist at the NASA's Jet Propulsion Laboratory, California Institute of Technology, a Visiting Associate at the Division of Physics, Mathematics, and Astronomy at the California Institute of Technology (Caltech), BEL Distinguished Chair Professor at IISc, and an Adjunct Professor at the Indian Institute of Technology, Kharagpur. He received his Ph.D. in electrical engineering from Caltech in 2000. He is a Fellow of IEEE (USA) and IETE (India) and an IEEE Distinguished Lecturer.



His research interests include microwave, millimeter-wave, and terahertz receiver systems and radars, and development of space instruments for the search for life beyond Earth.

He has more than 300 publications in international journals and conferences and holds more than fifteen patents. He also received more than 35 NASA technical achievement and new technology invention awards. He received the IEEE Region 6 Engineer of the Year Award in 2018, Distinguished Alumni Award from the Indian Institute of Engineering Science and Technology (IIST), India in 2017. He was the recipient of the best journal paper award in 2013 by IEEE Transactions on Terahertz Science and Technology, best paper award for antenna design and applications at the European Antennas and Propagation conference (EuCAP) in 2017, and IETE Prof. S. N. Mitra Memorial Award in 2014.

# Speakers

## Sri Chanchalapathi Dasa

Vice Chairman, The Akshaya Patra Foundation

*Sri Chanchalapathi Dasa* is the Vice Chairman and Trustee, The Akshaya Patra Foundation, Senior Vice President, ISKCON Bangalore, and, the Governing Body Member, GBC Society of the Hare Krishna Movement. He has been working in the field of spiritual education since 1984 and social entrepreneurship since 2000.



Although he had been passionate about science since his youth, he got introduced to Indian spirituality as an undergraduate student in PSG College of Technology, Coimbatore. Impressed by the profound concepts of spirituality, he pursued it even more vigorously while doing his master's program in Electrical Communication engineering at IISc.

He joined ISKCON in 1984, became involved in Akshaya Patra in 2000, which has become the largest school meal program feeding over 1.7 million underprivileged children in twelve states in India. He was able to combine his values of compassion from his spiritual learning with his education in science and technology to create a social development organization like The Akshaya Patra Foundation.

He continues to research, teach and talk extensively on spirituality, social development and the intersection of science & spirituality.

## Dr. Cheryl Sundari Dembe

Professor Emeritus, Diablo Valley College

*Professor Emeritus Cheryl Sundari Dembe* (BS, University of Michigan '68; University of Chicago MS '70, PhD 2018) taught at Diablo Valley College for 37 years, serving three times as Department Chair, as interim Division Chair of Physical Science and Engineering, and heading architect selection and faculty design input for a new Physical Science facility.



She was the first woman chemist, chemistry department chair, and physical science division chair at the college, and one of the first women to have children while teaching. She was the first member of the faculty union board to request that maternity leave be part of the contract.

She created materials to accompany *The World of Chemistry*, a 26-episode television series hosted by Nobel laureate Roald Hoffmann. She taught at UC Berkeley on one sabbatical, and on another engaged 10 great minds in conversations on the scientific-metaphysical interface, including Linus Pauling.

Barred from normal research pathways without the doctorate, she developed 25 original chemical theories applied to life, society and the individual, interwoven at a lay level in her book *The Choice of Happiness: Glimpses from an Extraordinary Ordinary Scientific Mystical Life*.

# Speakers

## Fred Dory

Special Counsel, Cooley



*Fred Dorey* is a special counsel in the life sciences practice group of Cooley's business department and is active in the clean technologies practice group. He represents a range of biotechnology, instrumentation and other technology companies at various stages of development from startup and incorporation through licensing, corporate partnering and major collaboration transactions. He also has extensive experience negotiating clinical trials, sponsored research and intellectual property agreements. In addition, Fred advises a number of major foundations, research institutions and individuals regarding their participation in biomedical research endeavors, including investment, licensing and commercialization activities.

Before joining Cooley in 1997, he was the first president of the Bay Area Bioscience Center, a consortium of research universities, biotechnology companies and local governments organized to support bioscience development in Northern California. Fred also served as part-time in-house counsel for several biotech companies, including Tularik, Geron and Shaman. Previously, he had served as general counsel and corporate secretary for British Petroleum in San Francisco, where he was chief legal advisor for the Fortune 500-sized subsidiary that handled all BP oil exploration and production in the United States.

He has also served as a regulatory enforcement lawyer and assistant office director for the Department of Energy in Washington, DC.

Fred was president of the University of Southern California Gould School of Law's Student Bar Association. Before law school, he served as a White House intern in the Peace Corps director's office in Washington, DC. Fred currently serves as a director of the BayBio Institute and the National Board of Community Health Charities. He is a member of the President's Council of the Gladstone Institutes and is active with the American Liver Foundation.

# Speakers

## Dr. Pradip Dutta

Professor & Chairman, Mechanical Engineering, IISc

*Professor Pradip Dutta* is Professor and Chairman, Department of Mechanical Engineering at IISc. He received his B.Tech from IIT Kharagpur (1983), M. Tech from IIT Madras (1987), and Ph.D. from Columbia University (1992), all in Mechanical Engineering.

His research group focuses on the development of advanced energy technologies related to solar energy, spacecraft thermal management, and on thermal technologies related to phase change. At IISc, he has been a co-founder of the National Facility for Semisolid Forming, co-Director of the General-Motors-IISc Collaborative Research Lab, and co-leader of the India-US Consortium, the Solar Energy Research Institute for India and the United States.

Pradip has been elected Fellow of the ASME, and Fellow of all the four National Academies in science and engineering. He has received Distinguished Alumnus Awards both from IIT Kharagpur and IIT Madras, Outstanding Teacher Award from the Indian National Academy of Engineering, and J.C. Bose National Fellowship.

He is Associate Editor of IEEE Transactions on Components and Packaging Technology, and ASME Journal of Electronic Packaging. He is the President of the Indian Society for Heat & Mass Transfer.



## Dr. Ananda Ghosh

Founder, Stempeers.org

*Ananda* founded Stempeers.org realizing dearth of mentorship and platforms dedicated to social and career issues for the growing worldwide STEM workforce. He is keenly interested in building passionate communities as a solution to some of the world's problems. He along with his friends are now working on Jigyasa, an online educational platform, that aims to make quality education freely available to anyone who has access to the internet.

An IISc alumnus, he currently works as a business development professional at the NYU's Technology Ventures and Partnerships (TVP) working at the interface of biomedical research and business development. At TVP, he helps transfer cutting-edge technologies to healthcare companies and consumers. In his spare time, he manages a New York based South Asian music band called Imon and spends time either jamming or performing in and around New York. A proud dad now he loves life as it is.



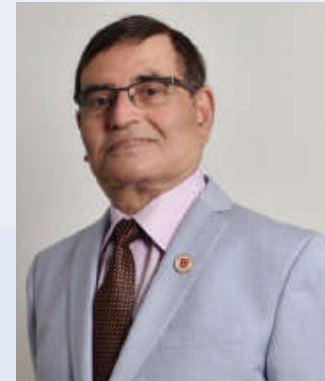
# Speakers

## Dr. D. V. Giri

Founder, Pro-Tech

*Dr. D. V. Giri* through his consulting company Pro-Tech, has provided services to several defense contractors and governmental organizations in US and Western Europe. He has taught short courses in his field of expertise in many countries including India. He has made significant contributions in the design and development of many NEMP Simulators around the world used to study the vulnerability of aircrafts, missiles, ships etc. to high-altitude nuclear bursts. Dr. Giri has made noteworthy contributions to the design of radiation systems for the high-power microwave systems and in the design and development of the ultra-wideband (UWB) systems which finds many applications such as detection of buried unexploded mines, and several other applications in various civilian sectors. One of his books was published by Harvard University Press in 2004.

He received Hind Rattan (Jewel of India) and Non-Resident Indian of the year awards in 2017. He is also a recipient of many international awards such as IEEE John Krauss Antenna award, Life Fellow of the IEEE, Prestigious Electromagnetics Fellowship from the SUMMA foundation, USA as well as best paper awards for 3 of his papers. He has served as a Visiting Professor at IISc under the BEL Chair Program. Dr Giri has a PhD from Harvard University and BE and ME from Indian Institute of Science.



## Dr. Rohini Godbole

Professor, Centre for High Energy Physics, IISc

*Professor Rohini Godbole* received the Padma Shri award of the government of India in 2019.

She obtained her MSc from the Indian Institute of Technology, Mumbai, and PhD in theoretical particle physics from the State University of New York at Stony Brook in 1979. Prof. Godbole joined Tata Institute of Fundamental Research, Mumbai as a visiting fellow in 1979. She was Lecturer and Reader at the Department of Physics, University of Bombay from 1982 to 1995. She joined the Centre for Theoretical Studies at the Indian Institute of Science, Bangalore, as Associate Professor in 1995 and has been Professor since June 1998. Currently she is Professor at the Centre for High Energy Physics, Indian Institute of Science, Bangalore. She is the author of more than 150 research papers, many of which have some of the largest citation indices in her area.



# Speakers

## Dr. Shuli Goodman

Founder and Executive Director, LF Energy

*Dr. Shuli Goodman* is the founder and Executive Director of LF Energy, a Linux Foundation project that supports open source innovation in the energy and electricity sectors. LF Energy accelerates the energy transition and the decarbonization of the world's economies through shared technology collaboration. Having spent the early part of her career enabling some of the world's largest companies in the world to become Internet ready, she has brought her digital-first, cross-industry background to the electricity sector.

With a doctorate in Organizational Systems focused on innovation and the energy transition, Shuli has a uniquely multi-disciplinary approach to solving complex, interdependent problems. She has nearly three decades experience in the startup and ongoing support of governance and multi-stakeholder engagement bodies that have been convened to enable decision-making and provide steering capacity for high-visibility and/or high-risk initiatives. Her goal is to inspire, train, and enable 10,000 developers in the next decade to digitally transform the world's power systems.



## Madhukar Govindaraju

AI/ML Data Engineering and Security Analytics, VMWare

*Madhukar Govindaraju* is currently an R&D Leader, within the End User Computing Unit, at VMware, Inc. responsible for Security Analytics and ML/AI. He was previously the Senior Vice President of Engineering at E8 Security, Inc. (acquired by VMware), and currently serves as a member of the Board of Advisors at i2Chain, Inc. and StartupWind, Inc. Madhukar is also an Official Member of the Forbes Technology Council.

In addition to a master's degree in Computer Science from the Dept. of Computer Science and Automation, IISc, Madhukar has also attended the Doctoral program in Computer Engineering at the University of California, Irvine, and the Executive Leadership Program at the University of California, Berkeley, Haas School of Business.



# Speakers

## Bin Hu

Chairman, OPNFV Technical Steering Committee

*Bin Hu* focuses on implementing AT&T's open source strategy in network virtualization, SDN and network cloud, being a part of Network Cloud and Infrastructure team in AT&T Labs,. Bin is the Chairman of OPNFV Technical Steering Committee and convener of OPNFV's technical community. He is driving OPNFV's new strategy of supporting a common telco NFVi, and OPNFV Verified Program (OVP) for VNF testing and certification. He is an OPNFV Ambassador, the Winner of OPNFV 2015 Annual Award, and the recipient of OPNFV 2015 Q3 Collaboration Award. In addition, Bin was a recipient of OMA Contributor and Achievement Award for Outstanding Contribution in Content Delivery and Cloud Computing. Bin was also the Chairman of IEEE ComSoc SCV Chapter (2007 and 2009). Under his leadership, SCV Chapter won IEEE ComSoc Chapter Achievement Award of North America Region in 2009. Bin Hu's previous speaking experience includes OpenStack Summit, OPNFV Summit, ONS, NFV World Congress etc.



## Dr. Thomas Kailath

Hitachi America Professor of Engineering, Emeritus, Stanford

*Professor Thomas Kailath* (BE (Telecom), Pune, 1956; SM, 1959. ScD, 1961, MIT) worked at Caltech's Jet Propulsion Laboratory, before joining Stanford in January 1963 as an Associate Professor of Electrical Engineering. He was promoted to Professor in 1968, and is currently Hitachi America Professor of Engineering, emeritus.



His research and teaching have spanned a large number of engineering and mathematical disciplines, with the major focus changing roughly every decade, and in the course of which he mentored a stellar array of over 100 doctoral and postdoctoral scholars, over half of whom are already IEEE Fellows. Their joint efforts have led to over 300 journal papers, a dozen patents, and several books and monographs. With his students, Kailath also co-founded several companies, two of which went public, while the others were acquired.

Kailath was awarded a National Medal of Science by President Barack Obama "for transformative contributions to the fields of information and system science, for distinctive and sustained mentoring of young scholars, and for translation of scientific ideas into entrepreneurial ventures that have had a significant impact on industry."

Other major recognitions include the IEEE Medal of Honor, the Padma Bhushan, election to the US National Academies of Engineering and of Sciences, foreign membership in the Royal Society of London and all the Engineering and Science Academies in India. He has held Guggenheim, Churchill, and Humboldt fellowships and received several honorary degrees.

# Speakers

## Dr. Ravi Kiron

Head, BioPharma External Innovation at EMD Serono, Inc.

*Dr. Ravi Kiron* is well versed in various aspects of the pharma and biotech R&D value chain across from early discovery, pre-clinical through late-stage clinical development, IP & regulatory strategy, corporate, product, technology & business development, marketing & launch—for well over 30 years.

He has held consulting operational business roles at various biotech's (e.g. Aduro, Kinemed, Amarantus, Clasado), cofounded companies (C2N Diagnostics, Navya Biomedical Technologies, iRetainRx), was an EIR (Entrepreneur/Executive in Residence) at SRI International and ShangPharma Innovation. He consulted for many (>50clients/10years) global pharma, biotech's, diagnostics, CRO's, Private Equity, Hedge Funds and Universities for M&A due diligence, market assessment, valuation, fund-raising through global VC's, HNWI, Foundations, BD and in/out licensing.

Dr. Kiron gained experiences at large pharma (Pfizer and J&J/ALZA) in various scientific, business, executive roles—Cardiovascular Drug Discovery, Oncology Drug Development, Business Development, Strategic Alliances, Project & Alliance Management, Drug Delivery Licensing and IP management. At Pfizer, he was primary architect of many global partnerships, was an acquisition/integration team member for Pfizer's purchase of Warner Lambert (\$95B) Pharmacia (\$65B), and other biotech companies. Dr. Kiron was also exploratory drug development project champion at Pfizer resulting in IND filing of Tarceva® for the treatment of NSCLC and filed an IND for Clasado of a novel prebiotic to prevent Travelers Diarrhea—leveraging the human microbiome.

Earlier in academia, Dr. Kiron was a tenure-track Assistant Professor of Biochemistry & Medicine faculty (joint appointments) at Cornell University Medical Center (NY Hospital), New York and had an Adjunct appointment at University of Rhode Island, Kingston, RI, USA. He serves on non-profit BOD's.

He holds BSc in Chemistry, MSc in Microbiology through colleges in Goa, India, under Bombay University, earned PhD in Biochemistry from the Indian Institute of Science, Bangalore, India and an MBA in Entrepreneurship from Rensselaer, New York, USA.



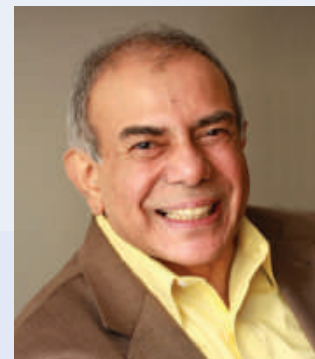


# Speakers

## Dr. Ganesh Kishore

Co-founder, Spruce Capital Partners

*Dr. Ganesh Kishore* is a co-founder and Managing Partner at Spruce Capital Partners. He has a distinguished track record of accomplishments in biotechnology research and development and business. After receiving a Ph.D. in biochemistry from the Indian Institute of Science, he received postdoctoral training in chemistry and biology at the University of Texas at Austin.



He then joined Monsanto, where he made contributions to the discovery of Roundup Ready technology and the synthesis of Aspartame. During his tenure at Monsanto, he was named a Distinguished Science Fellow and won the prestigious Queeny Award. Before moving to DuPont, he served as the President of Monsanto's Nutrition & Consumer Sector.

He joined DuPont as the Chief Technology Officer of Agriculture & Nutrition. He retired from DuPont to join Malaysian Life Science Capital Fund, as CEO and later co-founded Spruce Capital Partners.

He serves on the board of several companies, academic institutions, and the advisory board of Scientific American. He's a recipient of Bio's Legacy Award, ASPB's Innovation Award.

## Dr. Brian K. Kobilka

Professor, Stanford University School of Medicine  
Recipient of Nobel Prize in Chemistry, 2012

*Prof. Brian K. Kobilka* won the Nobel Prize in Chemistry in 2012 for studies of G-protein-coupled receptors. He is currently a Professor in the Department of Molecular and Cellular Physiology at the Stanford University School of Medicine, Stanford, CA.



He received a Bachelor's Degree in Biology and Chemistry from the University of Minnesota, Duluth, and earned his M.D., cum laude, from Yale University School of Medicine. Following the completion of his residency in internal medicine at Barnes-Jewish Hospital in St. Louis, Missouri, Prof Kobilka was a postdoctoral fellow under Robert Lefkowitz at Duke University. He moved to Stanford in 1989. He was a Howard Hughes Medical Institute investigator from 1987 to 2003, and in 1994 the recipient of the American Society for Pharmacology and Experimental Therapeutics John J. Abel Award in Pharmacology.

# Speakers

## Raja M. Koduri

Chief Architect, Intel Corporation

*Raja M. Koduri* is senior vice president of the Core and Visual Computing Group, general manager of edge computing solutions and chief architect at Intel Corporation. Koduri leads the expansion of Intel's leading position in integrated graphics for the PC market with discrete graphics solutions for a broad range of computing segments. He also leads differentiated IP across computing, graphics, media, imaging and machine intelligence capabilities for the client and data center segments, artificial intelligence, and emerging opportunities like edge computing. From 2009 to 2013, Koduri served as director of graphics architecture at Apple Inc. Earlier in his career, Koduri held various graphics leadership roles at AMD and ATI Technologies Inc., which included spearheading GPU performance initiatives in hardware and software, creating a GPU computing ecosystem and contributing to graphics product features.

Koduri holds a bachelor's degree from Andhra University and a master's degree from IIT Kharagpur, both in electronics and communications. He serves as chief technical adviser to the board of directors for Makuta VFX, an award-winning visual effects and animation company.



## Dr. Sudhir Kshirsagar

President, Global Quality Corp

*Dr. Sudhir Kshirsagar*, President of Global Quality Corp.(GQC), has leveraged his unique educational background (B.Tech. in Electronics from IIT Kharagpur, MS in Computer Science from IISc Bangalore and Ph.D. in Environmental Systems Engineering from University of Illinois - Urbana) and his vast consulting and product development experience to create the HydroTrek smart water product series that uses Internet of Things (IoT), On-premise and Cloud Computing, and deep machine learning.

HydroTrek products integrate IoT sensor data for smart modeling of water & wastewater systems, what-if modeling of stormwater LID controls, advanced river spill modeling and harmful algae bloom monitoring and detection in lakes. GQC develops IoT hardware for environmental sensing and provides low cost IoT telemetry options. He participates in several professional societies including ACM, IEEE and AWWA, and chairs the Smart Water Technologies track committee at EWRI-ASCE. He is exploring collaborative activities with the IIT's and IISc.



# Speakers

## Dr. Anurag Kumar

Director, Indian Institute of Science

*Professor Anurag Kumar* is currently the 20th Director of the Indian Institute of Science at Bangalore, India. He was a professor at the Department of Electrical Communication Engineering, and the Chairperson of the Electrical Sciences Division at the Indian Institute of Science, before becoming the Director in 2014.

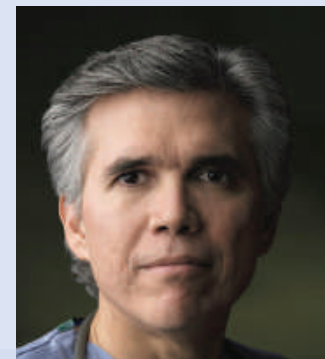


Dr. Kumar obtained his B.Tech degree in electrical engineering from the Indian Institute of Technology, Kanpur in 1977, and his Ph.D. from Cornell University in 1981. He worked at Bell Labs in the US before joining as faculty at IISc. His main research area used to be TCP/IP, but now he has moved into wireless networking focusing on sensor networks. From 1989 to 2001, he coordinated the project ERNET which was instrumental in bringing network connectivity to Indian students and researchers in the late 1980s and early 1990s. He has been an elected Fellow of the Indian National Academy of Engineering since 1999 and an elected Fellow of the Indian National Science Academy since 2006. He is also a fellow of Indian Academy of Sciences from 2010 and an elected Fellow of the IEEE. He received the CDAC-ACCS Foundation Award for 2009 by the Advanced Computing and Communications Society.

## Dr. Cesar Molina

Co-founder, South Asian Heart Center, El Camino Hospital

*Dr. Molina* is a practicing cardiologist and in Mountain View, California. He is the co-founder and Medical Director of the South Asian Heart Center at El Camino Hospital. Dr. Molina obtained a Bachelor of Science from Boston College, where he graduated with honors as a Scholar of the College. He obtained his medical degree from Yale University. Dr. Molina completed his M.D. thesis at the Joslin Clinic at Harvard University Medical School. Dr. Molina completed his medical, clinical pharmacology and cardiology training at Stanford University Medical Center, where he was a member of the medical school faculty and a Robert Wood Johnson Scholar. Dr. Molina frequently appears in the media discussing the benefits of diet, exercise and stress reduction in the treatment and prevention of coronary heart disease. Among many other topics, Dr. Molina's research interests include the role of lifestyle factors and longevity, and the epidemiology of coronary artery disease in South Asians. Dr. Molina is well versed in the ancient science of Ayurveda and a long-term practitioner of the Transcendental Meditation Technique.



# Speakers

## Dr. Walter H. Moos

CEO of ShangPharma Innovation



*Dr. Walter H. Moos* became Managing Director of Pandect Bioventures in 2018 and has been CEO of ShangPharma Innovation since 2017 and an adjunct Professor of Pharmaceutical Chemistry at UCSF since 1992. He was previously President of SRI Biosciences until 2016, after more than a decade at the independent nonprofit SRI International (Stanford Research Institute), which he joined in 2005 as Vice President and Biosciences Division Head. He also managed corporate Information Technology Services at SRI from 2011-2014. Earlier he was Chairman/CEO of MitoKor (Migenix) and a Vice President at Chiron (Novartis) and Warner-Lambert/Parke-Davis (Pfizer).

Moos and his teams have made significant contributions to all R&D phases, from early-stage research on therapeutics and diagnostics to marketed pharmaceutical products. They have advanced many drugs and biologics from bench to bedside, supported by Alta Partners, the Gates Foundation, the National Institutes of Health (NIH), Pfizer, and many others. Moos has served on about 20 business and scientific boards, not-for-profit and for-profit, including Aprinoia Therapeutics, Axiom Biotechnologies (Sequenom), the Biotechnology Industry Organization (BIO), Circle Pharma, the Critical Path Institute, Global Blood Therapeutics, Keystone Symposia, Mimotopes (Thermo Fisher), Oncologic (Aduro), Onyx (Amgen), Rigel Pharma, and Valitor.

He has advised companies on several continents and served as a committee member for academic, government, and investor groups, including the Univ. of Michigan, the U.S. National Academy of Sciences, and Red Abbey Venture Partners. He has co-founded several scientific journals, co-authored or co-edited 6 books, and has over 170 patents and publications. Moos has held faculty positions at several major universities and received Ph.D. and A.B. degrees in chemistry from U.C. Berkeley and Harvard Univ., respectively.

# Speakers

## Poshit Nag

Master's Student, Harvard Divinity School

*Poshit Nag Mandali* is a master's student at Harvard Divinity School studying Science and Religion. Prior to this, he spent several years working in the areas of condensed matter physics and computational materials science. He did his master's from Materials Engineering Department, IISc in the year 2013. He has been actively leading science and spiritual discussions at Massachusetts Institute of Technology, Harvard and at other universities. He is also serving as the IISc AANA Boston Alumni Chapter President since 2018. He is interested in the intersection of arts, culture, religion and science. In this regard, he is developing a special concentration at Harvard.



## Dr. Rajesh Nair

Professor, Practice in Innovation & Entrepreneurship,  
Asia School of Business, Case Western University

*Prof. Rajesh Nair* is an inventor, product designer, and entrepreneur with more than 25 years of experience in multiple startups in the Boston area. He is Professor of Practice in Innovation & Entrepreneurship at Asia School of Business, a new school started by MIT-Sloan and the Central Bank of Malaysia in Kuala Lumpur, where he heads the ASB-Innovation & Entrepreneurship Center. He also serves as Visiting Scholar at Massachusetts Institute of Technology.

His research focus is on building local entrepreneurship ecosystems from the ground up. He founded three product manufacturing companies in the US. He is also the founder of a nonprofit organization, TechTop Trust, that promotes innovators & entrepreneurs among Indian youth since 2006. His work has catalyzed more than 50 student startups. His last startup, DegreeC was judged to be the Fastest Growing Company in NH by Business NH magazine. He received Entrepreneur of the Year at New Hampshire High Tech Council. He has given talks at the UN General Assembly and TEDx events on his work on catalyzing young entrepreneurs.

Professor Rajesh Nair holds 13 US patents. He received master's degrees in Engineering & Management (MIT), Manufacturing Engineering (UMass, Amherst) and Electronic Product Design (IISc).



# Speakers

## Dr. Omkaram Nalamasu

Senior Vice President and Chief Technology Officer,  
Applied Materials

*Dr. Omkaram (Om) Nalamasu* is the Senior Vice President and Chief Technology Officer at Applied Materials, and one of the industry's most respected and forward-looking innovation thought leaders. As the Chief Technology Officer, he is responsible for developing new product pipelines and maintaining the company's materials engineering technology and market leadership for profitable growth. Dr. Nalamasu is also the president of Applied Ventures LLC, the venture capital arm of Applied Materials, where he oversees strategic investments in startups.

Dr Nalamasu has made seminal contributions to the fields of optical lithography and polymeric materials science and technology. He has received numerous awards, authored more than 180 papers, review articles and books, and holds more than 120 worldwide issued patents. He is also a member of the Singapore government's Advanced Manufacturing and Engineering International Advisory Panel, the board of directors of Tech Museum in San Jose, and serves on several international and national advisory boards. He is also a recently elected Member of the U.S. National Academy of Engineering – amongst the highest professional distinctions accorded to an engineer.

He received his Ph.D. from the University of British Columbia, Vancouver, Canada.



## Dr. Yadati Narahari

Professor, Computer Science and Automation, IISc

*Professor Yadati Narahari* is currently a Professor at the Department of Computer Science and Automation, at IISc. He is also the chairman of Division of EECS (Electrical, Electronics, and Computer Sciences) at IISc.

The focus of his current research is on exploring problems at the interface of computer science and game theory. In particular, he is interested in applying mechanism design to problems in auctions, market design, blockchains, social network analysis, crowd-sourcing, and online educational platforms.

He has recently brought out a textbook entitled “Game Theory and Mechanism Design” brought out by the IISc Press and the World Scientific Publishing Company. He is a fellow of INAE, IEEE, INSA, IASC, and NASI, and a J.C. Bose National Fellow. More details at: [lcm.csa.iisc.ernet.in/hari](http://lcm.csa.iisc.ernet.in/hari)



# Speakers

## Dr. Latha Palaniappan

Professor, Medicine, Stanford University Medical Center

*Professor Latha Palaniappan* MD, MS, is a Professor of Medicine at the Stanford University Medical Center. Her research has focused on the study of diverse populations, chronic disease and prevention. Dr. Palaniappan specifically seeks to address the gap in knowledge of health in Asian subgroups and other understudied racial/ethnic minorities. She was the co-founder of PRANA (along with Dr. Ronesh Sinha), a South Asian Wellness program and co-leads the Stanford GenePool (founded by Dr. Thomas Quertermous in 2014) at Stanford, a population-based biobank designed to accelerate genetic and other -omics discovery. She co-founded the Center for Asian Health Research and Education (CARE) at Stanford in 2018.

Prof Palaniappan received the Asian American Faculty Award at Stanford University (2016) and the Healthcare Hero Award, Silicon Valley Business Journal (2013)



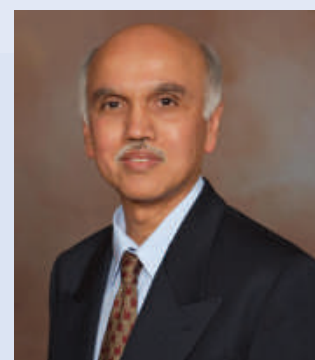
## Dr. G. K. Surya Prakash

Chairman, Department of Chemistry,  
University of Southern California

*Professor G. K. Surya Prakash*, Chairman of the Department of Chemistry at the University of Southern California (USC), is also the Director and Olah Nobel Laureate Chair in Hydrocarbon Chemistry at the Loker Hydrocarbon Research Institute. He obtained his Ph.D. in chemistry in 1978 at USC.

His research encompasses superacid, hydrocarbon, synthetic organic, organosilicon and organofluorine chemistry. He has trained more than 125 doctoral and post-doctoral scholars. He has over 800 peer-reviewed publications, 100 patents and 14 books. Notably, the book “Beyond Oil and Gas: The Methanol Economy” that he co-authored has had worldwide attention. He is a Fellow of the AAAS, a Member of the European Academy of Arts, Sciences and Humanities, a Fellow of the European Academy of Sciences, Foreign Fellow of National Academy of Sciences, India and a Fellow of the American Chemical Society. He also sits on Editorial Boards of several International Journals.

He has received many awards including those from ACS - 2004 *Creative Work in Fluorine Chemistry*, 2006 *George A. Olah Award in Hydrocarbon or Petroleum Chemistry*, 2006 *Richard C. Tolman Award* and 2018 *Arthur C. Cope Late Career Scholars Award*, 2013 *Eric and Sheila Samson Prime Minister's Prize for Innovation in Alternative Fuels for Transportation* by the State of Israel (with Professor Olah), 2015 *Henry Moissan International Prize*, 2007 *Distinguished Alumni Award* from IIT, Madras and the 2010 *CRSI Medal* from the Chemical Research Society of India.



# Speakers

## Dr. Yahya Rahmat-Samii

Professor, Electrical and Computer Engineering, UCLA

*Professor Yahya Rahmat-Samii* is the Northrop-Grumman Chair in electromagnetics at UCLA. His research focus is in the area of electromagnetics with wide ranging applications in antenna developments for satellite communication, personal communications, remote sensing and radio astronomy, biotelemetry and RFID. His original antenna designs are on many NASA/JPL spacecrafts for planetary, remote sensing and Cubesat missions (visit [www.antlab.ee.ucla.edu](http://www.antlab.ee.ucla.edu)).



Professor Rahmat-Samii is an esteemed member and fellow of many organizations such as IEEE, AMTA, ACES, EMS, URSI and so on. He has authored/co-authored five books, 35 book chapters and over 1000 technical publications and conference presentations. He is also the recipient of many prestigious awards and accolades throughout his career. Some of the notable awards he received are: 1984 Henry Booker award from URSI for young radio scientist, IEEE Third Millennium Medal and the AMTA Distinguished Achievement Award in 2000, Technical Excellence Award from JPL in 2002, URSI Booker Gold Medal in 2005, Member of the Royal Flemish Academy of Belgium for Science and the arts and the US National Academy of Engineering (NAE), several teaching awards (in 2010, 2011 and 2015), IEEE Electromagnetics Field Award in 2011, ACES Computational Electromagnetics Award and IEEE Antennas and Propagation S. A. Schelkunoff Best Transactions Prize Paper Award in 2017.

## Nandini Ramani

CEO, Outcome Health

*Nandini Ramani* is Chief Operating Officer at Outcome Health, where she leads the product and operations functions to ensure the most rigorous health information platform and campaign audit standards in the industry. Previously she held the position of Chief Engineering Officer to scale and strengthen the technology platform and hardware that enable physicians to better discuss diagnosis and treatment with patients.



Nandini has extensive experience leading both hardware and software engineering teams. She was previously at Twitter, leading engineering effectiveness for the social media company's 1,300-person technical organization. Prior to Twitter, Nandini led the \$320M Java business unit for Oracle, and previously served as Senior Director of the Client Software group at Sun Microsystems.



# Speakers

## Beth Rogozinski

CEO at Signal 2 Health

*Beth Rogozinski* is a serial entrepreneur, technology professional, and business strategist who has spent the last several years focused on digital medicine. Beth has worked in hardware, software and services at such top firms as Silicon Graphics, Macromedia, and the digital agency Circle and has also founded games and apps companies including Signal 2 Productions, Match Factor and D2S Games.



She has produced and published more than 30 games and apps, including over a dozen apps for health and wellness. At Pear Therapeutics, Beth served as Chief Product Officer and led the development of Pear's first clinical product, reSET, and the product team submission of the De Novo 510(k) to the FDA which was cleared by the FDA in 2017 as the first ever prescription digital therapeutic.

Beth is an advisor to many start-ups and accelerators and has consulted with local and international venture groups around digital health investments. Beth serves on the Biotechnology Innovation Organization's educational programs committees for Digital Health and chairs the program for Brain Health. She has written and published on digital therapeutics and tech innovations and is a frequent speaker at technology and healthcare events.

## Dr. Prakriteswar Santikary

Vice President and Global Chief Data Officer, ERT

*Dr. Prakriteswar Santikary* is an accomplished technology and business executive in building and commercializing software products and platforms across a variety of industries using sophisticated techniques of distributed computing, cloud computing and artificial intelligence. In his current role as Vice President and Global Chief Data Officer at ERT, a global data and technology company that minimizes risks and uncertainties in clinical trials industry, Dr. Santikary is leading the vision, strategy and execution of ERT's global data and platform architecture and Artificial Intelligence Center of Excellence.



Before joining ERT, Dr. Santikary held several technology executive roles, including serving as Head of Data Engineering and Director of Engineering at eBay, VP of Software Engineering at Zeta Global, Chief Architect and Technologist at Sunovion Pharmaceuticals, Director of Data Science at EnerNOC, Chief Data Architect at PNC Financial and Post-doctoral fellow and Research Scientist at The University of Michigan, Ann Arbor. Dr. Santikary earned his PhD degree in Computer Simulation from Indian Institute of Science, Bangalore. A thought leader and an AI evangelist, Dr. Santikary presents his R&D work frequently at global conferences including at IBM Chief Data Officer Summit and MIT Chief Data Officer and Information Quality Conference.

# Speakers

## Andrew Setikas

Senior Vice President, Business Development & Strategy,  
California Life Sciences Association



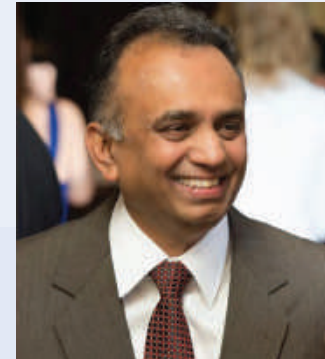
*Andrew Setikas* joined the California Life Sciences Association (CLSA) in March 2019 and serves as Senior Vice President of Business Development and Strategy. Based in CLSA's South San Francisco office, Setikas leads all business development, membership and strategic alliance activities for the association. Setikas joins CLSA from Thermo Fisher Scientific, the world leader in serving science, where he most recently served as Senior Director of Business Development, leading a group of corporate directors and teams focused on executive relationships, total company sales and collaborations with strategic academic, biotechnology and government accounts. Prior to his 12 years at Thermo Fisher, Setikas held numerous positions of increasing responsibility in the life sciences, including business development roles at Roquette Frères, Adhesives Research Inc, and FMC Corporation. Setikas holds an MBA in Management from the University of San Francisco, and bachelor's degrees in Chemistry and Environmental Sciences from Rutgers University.

A commercial leader with broad experience in leading teams, global and regional sales, business development and project/program management. Proven record for consistently exceeding targets within a variety of domestic and international markets, designing and executing on complex initiatives and consistently meeting commitments. Passionate about people, science and creating incremental value both financially and personally for organizations and the teams that he is involved with.

# Speakers

## Dr. Sree N. Sreenath

Professor, Electrical Engineering & Computer Science,  
Case Western University



*Professor Sree N. Sreenath*, Ph.D., MNO, Professor in the Electrical Engineering and Computer Science Department at Case Western Reserve University, is also the Director of Case's Graduate Engineering & Management National and International Program. His research and educational interests are in complexity, with applications in Systems Biology (leukemia, prostate cancer and hydrocephalus), Global Issues, and Sustainable Development. He served the Co-Director of UNESCO GENIE Program (an international network of educational institutions), and as the Director of the Complex Systems Biology Center at Case. He consults with many developing countries on issues of water, energy, and policy development.

Professor Sreenath was honored with the Who's Who Among Teachers in America and the NIH Research Career awards. He has been a member of several committees on Climate Change and Environment, World Water Commission (1998-2000), UN World Water Assessment Program, and many National Science Foundation (NSF) and National Institutes of Health (NIH) committees. He has lectured in 25 countries, and has organized more than 40 workshops, symposia, and conferences. He is a practitioner of Vedic Math for over 30 years and has developed a curriculum to educate children.

Professor Sreenath's is also active in providing social services and promoting Indian culture. He is the Executive Committee member of NAVIKA, a national cultural organization. He is the President of Sewa International, a Hindu faith-based charitable nonprofit working in the areas of disaster recovery, education, and development. Sreenath was inducted into the 2019 Class of the Cleveland International Hall of Fame.

# Speakers

## Dr. Eri S. Srivatsan

Professor of Surgery, David Geffen School of Medicine, UCLA

*Dr. Eri S. Srivatsan* received his high school education from the Tamil Nadu government high school at Ranipet. He received his Bachelor's degree in Chemistry from AM Jain College at Meenambakkam, TN and Master's degree in Biochemistry from the University of Madras. He obtained his PhD at IISc. He received post-doctoral training on animal viruses at UCLA. He is now a professor of Surgery at VAGLAHS/David Geffen School of Medicine at UCLA. His work focuses on the molecular mechanism of chemo resistance in human cancers.



Dr. Srivatsan started project RISHI, a student non-profit organization, at UCLA in 2005 with the help of 2 Medical students, Grant Lee and Ravi Menghani, and 2 undergraduate students Daniel Choi and Aswin Chandrasekar. The group now has a membership of 40 students. The group is working on the health improvement projects in his ancestral village Vadamanappakam in Tamil Nadu. Project RISHI chapters have opened in 5 UC campuses (UCSD, UCI, UCR, UCB and UCD), Cal State Pomona, Northwestern and Purdue Universities. These chapters have selected villages spanning India from Himachal Pradesh, Maharashtra, Rajasthan, Gujarat, and Andrapradesh. Project RISHI work in India by UCLA and all other chapters could be obtained from Project RISHI.org website.

## Vandana Tilak

CEO, Akshaya Patra USA

*Vandana Tilak* is the founder of Bombay Pictures, the Oshan Center and Almex USA, Inc. a family owned engineering firm specializing in aerospace aluminum cast house technology.

Vandana was appointed to the Akshaya Patra USA Board in 2015. As a pro bono CEO for an exemplary organization since January 2018, she oversees a lean staff of 12 and 600 volunteers in 24 chapters in cities across the US planning and implementing brand strategy, fund-raising and fostering donor relationships.



Akshaya Patra is a global charity organization raising funds to support the midday meal program in India. The organization operates 43 centralized mega kitchens and cooks and transports meals to government school children in 12 States in India. With sustainable scaling models starting with 1,500 meals in 2000, the organization currently feeds 1.76 million meals in 14,250 schools every day. The organization celebrated serving the 3 billionth meal with the Prime Minister of India, Narendra Modi. For more information: [foodforeducation.org](http://foodforeducation.org).

Vandana is a trained ayurvedic practitioner, an avid reader of philosophy and enjoys travel, poetry, music, portraiture and photography. Vandana and her husband Ravi live in Manhattan Beach, CA.

# Speakers

## Dr. Eugene Tu

Director, Ames Research Center

*Dr. Eugene Tu* serves as the director of Ames Research Center in Silicon Valley. He has a Ph.D. from Princeton University, New Jersey. In 1984, he applied for and was accepted into the Ames Education Associate Program for interns and after graduating he joined the Applied Computational Fluid Dynamics Branch. He was later selected as the deputy program manager for the agency's IT Base Research Program in 1997. From 1998 and 2002, he led the agency-level High Performance Computing and Communications Program and the IT Base Program, which later merged into the Computing, Information and Communication Technology Program. In 2003, he served in the Office of Biological and Physical Research at NASA Headquarters, and in 2004, he was the acting director for the Information Sciences and Technology Directorate at Ames.

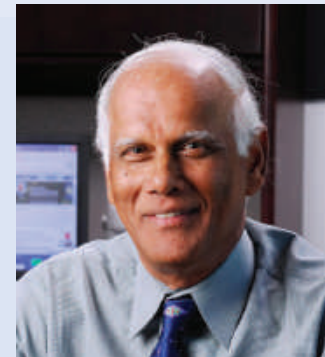
He was appointed the director of Exploration Technology at Ames in 2005, until his selection as Ames center director in May 2015.



## Dr. Rao Tummala

Professor Emeritus, Georgia Institute of Technology

*Prof. Rao Tummala* is a Distinguished and Endowed -Chair Professor Emeritus at Georgia Tech in USA. He is well known as an industrial technologist, technology pioneer, and educator. Prior to joining Georgia Tech, he was an IBM Fellow, pioneering such major technologies as the industry's first plasma display and industry's first 100-chip-on-a-substrate electronics hardware for inevitable replacement of Moore's Law. He invented many interconnect technologies for high-performance computers. As an educator, Prof. Tummala was instrumental in setting up the largest Academic Center in System-On-Package vision for Electronic Systems, funded by NSF as the first and only NSF Engineering Research Center in US at Georgia Tech. The Center with its integrated approach to research, education and global industry collaborations, with more than 200 companies in US, Europe, Japan, Korea, Taiwan, India and China, produced more than 600 Ph.Ds to supply to all the major electronic companies in US. He is a consultant to many High-Tech companies in US, Europe and Japan. He received more than 50 industry, academic and professional society awards including Distinguished Alumni of Indian Institute of Science, U of Illinois and the highest Faculty award from Georgia Tech—The Distinguished Faculty. He has published about 800 technical papers and invented many technologies that resulted in over 110 patents. He wrote the first modern textbook in packaging, *Microelectronics Packaging Handbook* (1988); wrote the 1st undergrad textbook, *Fundamentals of Microsystem Packaging* (2001); and the 1st book introducing the concept of SOP, *Introduction to System-on-Package* (2006). He was the Past President OF IEEE CPMT and IMAPS societies. He is an IEEE Fellow and member of National Academy of Engineering in US and in India.



# Speakers

## Dr. Yash Vaishnav

Business Development Executive,  
Lawrence Livermore National Laboratory



*Dr. Yash Vaishnav* is a Business Development Executive at Lawrence Livermore National Laboratory. He earned a PhD in Microbiology and Cell Biology from the Indian Institute of Science, Bangalore, and an MBA in finance from California State University. He has held faculty positions at the University of California, San Diego, and the International Centre for Genetic Engineering & Biotechnology, New Delhi. Yash has conducted research in molecular biology and virology, has published research articles in peer-reviewed scientific journals, and has presented findings at various scientific conferences. He has also taught advanced courses in molecular biology and virology to graduate students.

Yash has 30 years of experience in academic enterprise in research and business development. He has spent last 20 years in intellectual property management, technology transfer and business development positions at Knobbe, Martens, Olson and Bear, LLP, the University of California Office of President, University of California, Los Angeles, Arizona State University, Argonne National Laboratory, and Lawrence Livermore National Laboratory. In his current role at the Livermore laboratory he is responsible for comprehensive management of life science, biotechnology and health care technologies. He has extensive experience and successful track record of licensing therapeutic, diagnostic, medical device and platform technologies to biotechnology, pharmaceutical and medical device companies, forging industry partnerships, and in supporting and facilitating startup companies based on technologies from academic institutions.

# Speakers

## Sriram Viswanathan

Founding Managing Partner, WRVI Capital



*Sriram Viswanathan* is the Founding Managing Partner of WRVI Capital, a leading Silicon Valley based technology venture fund that focuses on investing in and scaling companies with disruptive technologies globally. Prior to WRVI Capital, Sriram was the founder of IndusAge Partners, a cross border Venture Firm investing in innovative companies in the US-India Technology corridor. Earlier in his career, Sriram spent nearly 20 years at Intel Corporation in various senior management roles, including Vice President of the Intel Architecture Group (IAG), Vice President of Intel Capital and General Manager of Intel's Incubation and Innovation Group. Sriram was also a founding team member and senior executive within Intel Capital, where he managed one of Intel's largest investment portfolios. In this role he was responsible for investments on a worldwide basis in the areas of mobile content and services, communication infrastructure, and mobile platforms. Sriram was also the head of Intel's Global Wireless Strategy and the Architect of Intel's 4G Wireless Broadband efforts. Early in his Intel career, he was the head of Hollywood Programs, leading Intel's strategic marketing activities in the U.S. entertainment industry. A two-time recipient of the prestigious Intel Achievement Award, for exemplary contributions to Intel's growth, Sriram was also honored with numerous of Intel Divisional Awards. Sriram joined Intel in 1993 as a technical marketing engineer supporting Intel's then CEO Andy Grove. Prior to joining Intel Sriram worked as Head of Emerging Technologies of Covansys (acquired by CSC), a systems integration and consulting firm in Detroit, Michigan. Currently he is on the Boards of Clairvortex, QuadGen Wireless and CloudLeaf. He has also been a Senior Advisor to ATIC (Mubadala, UAE and a Strategic Board Advisor to Bahwan CyberTek (BCT Oman), a global IT services firm. He is an Advisory Board Member of Aravind Eye Hospitals in India, and Gooru Learning in California. Sriram holds an MBA from UCLA Anderson School of Business (1997) and has degrees in physics, computer science and automation from the American College and the Indian Institute of Science, respectively.

# Speakers

## Dr. Manjula Bhushan Waldron

Adjunct Professor, Prevention Research Center, Stanford

*Dr. Manjula Bhushan Waldron* is currently an Adjunct Professor at Stanford University's Prevention Research Center. She received her BS (Physics) from Delhi University; a BE-ECE from IISc ('65); MS-EE ('68) and PhD-EE ('71) from Stanford. She is an author and lecturer on living well, mind-body medicine, neural networks and biomedical product design; now also a novelist.



In her 50 years of teaching, Dr. Waldron has taught at Stanford, University of Houston, Ohio State University, and University of New South Wales. At Stanford, she focuses on effects of Biosignals on longevity and advanced mind-body medicine. She has taught “Resilient aging for achieving longevity,” as well as science and spirituality courses for Stanford Continuing Studies. She has also taught a course on “design for diversity” and Smart robots at Stanford.

Dr. Waldron was the first Asian woman in Electrical Engineering at Stanford to get a Ph.D. She has been an adventurer in many ways: leaving India in the 1960s for graduate studies in the US, creating the first biomedical program in Australia, migrating from being a full professor in biomedical engineering to being a social and wellness engineer. Dr. Waldron has written a novel “Love Partitioned” based on her family's experiences as refugees during the Partition of 1947.



# Cultural Program

June 21, 2019

## Classical and Contemporary Dances and Music by the IISc Alumni/Alumnae Family

### 1. Classical Dances Focusing on Women Heroes

#### a. Queen of Jhansi: Kuchipudi dance by Anupama Gunupudi

This piece describes the courage and valor of the Queen of Jhansi (1830-1858). The queen is portrayed as a noble ruler, a wise minister, a compassionate counselor, and a loving mother. She is described as Trisakthi Swaroopini, the embodiment of the three supreme powers. Upon her husband's sudden death, the British Army captures her kingdom. The lion-hearted queen ties her son to her back and fights the British with swords and spears. She strategically plans the war and fights back, even after losing some of her greatest warriors. She plunges into the battlefield to fight for her kingdom until her last breath.

**Lyrics:** *Aparna Munukutla Gunupudi*

**Music:** *Asha Ramesh*

**Choreography:** *Jyothi Lakkaraju*

**Orchestra:** *Asha Ramesh (Vocal), Lakshmi Balasubramanya (Violin), Ashwin Krishnakumar (Flute), Ravindra Bharati Sridharan (Mrudangam), Jyoti Lakkaraju (Nattuvangam)*

#### b. Queen of Mysore: Bharatanatyam dance by Pooja Akella

This piece depicts the kind, generous, and righteous Queen of Mysore (1866-1934), who ruled the kingdom after her husband Chamarajendra Wadiyar X's sudden death. Appointed as a Regent, until her son was eligible to succeed the throne, she emerged from her sheltered palace life to skillfully rule the kingdom and take it forward. She cared for the welfare of her citizens by expanding the city and building a dam on the Cauvery River to provide adequate water supply. She emphasized the importance of education by building schools and supported establishing the Indian Institute of Science by donating the land. She sought the blessings of the female triumvirate, Chamundeswari, Lakshmi and Saraswati, to build the first school for girls and a hospital for women. She truly was a crown jewel.

**Lyrics:** *Aparna Munukutla Gunupudi and Susheela Murthy*

**Music:** *Asha Ramesh*

**Choreography:** *Shreelata Suresh*

**Orchestra:** *Shruti Aravindan (Vocal), Sanjna Arvind (Violin), Hrishikesh Chari (Veena), Ananth Kumar (Mrudangam)*

# Cultural Program

June 21, 2019

## 2. Prominent Women in Indian History: A Presentation by Anupama and Pooja

## 3. Contemporary Dances

1. Rachna Tiwari and Sujata Tibrewala (feat. Mardani)
2. Sangita Patil (Folk dance for a Marathi song: *Aai mauli chi maya*)
3. Chethana Damodara (Bhangra)

## 4. Hindustani Classical Music

**Flute:** *Hemant Thakkar*

**Tabla:** *Deepak Deolalikar*

# Artists

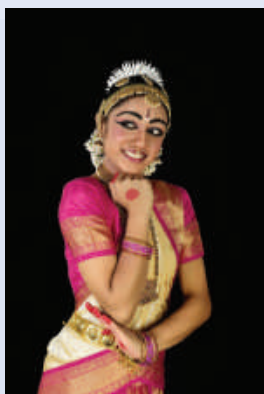
June 21, 2019

## Lead artists



### Anupama Lakshmi Gunupudi

*Anupama Lakshmi Gunupudi* learned Kuchipudi dance from Guru Smt. Jyothi Lakkaraju, Natyalaya School of Kuchipudi Dance and performed her Natyanjali in 2003 in Hyderabad, India. Her repertoire includes dance ballets such as Sugunamala, Rithu Sambhavam, Prasanna Ashtalakshmi, Usha Kalyanam and Trayadarsa – the latter, was presented at the IISc Global Conference 2007. She is an accomplished Carnatic music violinist and practices the art of Muay Thai. With Master's in Engineering, her day job is a Senior Program Manager. She is the daughter of Subbarao Gunupudi, an IISc alumnus (Biochemistry) and a founding member of IISc AANA.



### Pooja Akella

*Pooja Akella*, has been learning Bharatanatyam from Guru Smt. Mythili Kumar, Abhinaya Dance Company, San Jose, and performed her arangetram in 2017 and has toured with the Company including Vaanara Leela (2016, San Jose), Gandhi (2017, St. Louis and San Ramon), Sanchaari–Elaboration (2017; San Francisco International Arts Festival), The Parting (2018; San Francisco), the Navatman Drive East Festival (2018; San Francisco), and Cesar Chavez (2019; San Jose). She is a student of Carnatic music with Smt. Asha Ramesh and also trains in western classical piano. Pooja, a rising senior at Palo Alto High School, will serve as its President in 2019-20. Pooja is particularly excited to be dancing at the IISc Conference as she is the grand-daughter of Prof. A. K. Rao, a distinguished IISc alumnus, former faculty member, and Dean of Engineering.



### Hemant Thakkar

*Hemant Thakkar* plays the bamboo flute, called Bansuri, in the Hindustani classical style of music. He has studied with the eminent vocalist Dr. Laxmi Ganesh Tewari of Gwalior Gharana. He is an IISc alumnus and obtained his Masters from ECE in 1982.

# Artists

June 21, 2019



## Deepak Deolalikar

*Deepak Deolalikar* started learning Tabla by Ustad Sher Mohammed Khan of Delhi, who was the disciple of the maestro Ustad Ahmed Jan Thirakwa. He recorded his first Tabla solo on All India Radio (Yuva Vani) at the age of 16. He is a software product manager.

## Supporting Artists

### Jyothi Lakkaraju

Jyothi Lakkaraju, is the founder and Artistic Director of Natyalaya School of Kuchipudi dance and has trained a number of students in the Bay area over the past 25 years. She is trained in Kuchipudi under the tutelage of Guru Sri Chinta Radhakrishna Murthy and got advanced training from Dr. Uma Rama Rao. Jyothi has received awards such as Singara Mani and Nritya Bharathi. Her choreography includes dance ballets such as Sugunamala, Ruthu Sambhavam, Mahishasuramardhini, Prasanna Ashtalakshmi, Usha Kalyanam and Trayadarsa.

### Shreelata Suresh

Shreelata Suresh is the founder and Director of the Vishwashanthi Dance Academy. Shreelata combines the techniques of Bharatanatyam, yoga and meditation into a unified, powerful celebration of the human spirit. The group choreography, Poorthi, was nominated as a finalist at the Isadora Duncan Dance Awards. Shreelata says that she owes a lot to her illustrious Gurus, Vyjayanthimala Bali, Ramaswamy Bhagavathar, Dakshinamurthy Pillai and Delhi V. Krishnamoorthy, whose teaching and blessings continue to encourage and guide her. She is a dancer, teacher and choreographer of international acclaim.

# Artists

June 21, 2019

## Asha Ramesh

Asha Ramesh is the founder and Artistic Director of Ragamalika School of Music, San Jose. Asha started learning Carnatic music at the age of three in Jamshedpur, India. Asha's primary Gurus are Sangita Kalanidhi Sri D K Jayaraman and Nanganallur Sri V Ramanadhan. Asha has Master's degree in music with a Gold Medal from Madras University. She is also a trained Hindustani musician. Asha is the recipient of numerous awards and titles from organizations in the US and abroad. She has composed music for several songs, including Trayadarsa, the dance ballet presented at the IISc Global conference, 2007.

## Aparna Munukutla Gunupudi

Aparna Munukutla Gunupudi is a revenue controller by profession and writes poetry, short stories and lyrics as a hobby. In 2014, she published "Gharshana," a compilation of her short stories. She has written songs for Prema Tarangini, a music production by Manohar Murthy. She wrote many ballets that were choreographed and performed by prominent dance schools in the Bay area including "Trayadarsa" a dance ballet depicting the story of Sri. Jamsetji Tata.

## Susheela Murthy

Susheela Murthy is an accomplished writer and has published several books in Telugu and Kannada.

## Shruthi Aravindan

Shruthi Aravindan learns Carnatic music from Smt. Gayathri Girish. She has performed many concerts in the US and in India and has provided vocal support for many dance arangetrams. Shruthi learnt Bharathanatyam from Smt. Deepa Mahadevan and completed her arangetram in August 2008 at the age of 10. Shruthi is currently working as a System Engineer at Roche Sequencing Solutions.

## Sanjna Arvind

Sanjna Arvind learns the violin from her father, Sri Arvind Lakshmikanthan, who is a student of Lal-gudi Smt. Srimathi Brahmanandam. Sanjna performs as a soloist as well as an accompanist in music events in the Bay Area and has also performed in the Cleveland Thyagaraja Aradhana festival.

# Artists

June 21, 2019

## Ananth Kumar

Ananth Kumar learnt Mrudangam from Sri Ravindra Bharati Sridharan, disciple of Neyveli Narayanan. Ananth performed his arangetram in 2016. He became an Indian Raga Fellow and was named the Indian Raga Ambassador for California by the Indian Raga.

## Hrishikesh Chary

Hrishikesh Chary began learning veena at the age of six from his father Sri Srikanth Chary, disciple of the violin maestro Sri Lalgudi G Jayaraman. Since the age of 10, he has performed widely across the United States and in India and has won awards in various competitions. In 2017, Hrishikesh was invited to perform for a "Vadya Vrinda" alongside Sri VV Subramanyam by the Cleveland Thyagaraja Aradhana.

# Cultural Program

June 22, 2019

## Confluence: Science and Spirituality presented through Music

“Everyone who is seriously involved in the pursuit of science becomes convinced that a Spirit is manifest in the Laws of the Universe—a Spirit vastly superior to that of man, and one in the face of which we, with our modest powers, must feel humble.”—Albert Einstein

Science, Music and Spirituality are manifestations of human genius. This program is an effort to present both the science and spirituality through music and strike a perfect harmony for an enriching experience.





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Web: [www.gmsaudit.com](http://www.gmsaudit.com)  
Jag Kottha • Cell: 216-299-8011  
Anjali Kottha • Cell: 216-299-8878

#### REGIONAL OFFICE

2363 Rolling Forks Circle, #103  
Herndon, VA 20171  
Phone: 703-795-6052  
Web: [www.gmsaudit.com](http://www.gmsaudit.com)

#### SATELLITE OFFICE

2011 Crystal Drive, Suite 400  
Arlington, VA 22202  
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GMS Registrar is a world class Accredited Certifying Body (CB) providing Third Party Auditing and Certification Management Services helping companies, worldwide, for maintaining continued growth and meeting the cost and scheduling needs.

We specialize in Certification Audits for various ISO Standards, (ISO Track), CMMI (CMMI Business Partner: CMMI Track) and GSA Approved 3PAO for FedRAMP (FedRAMP Track) through Accredited Registrars and with locally deployed certified auditors.

GMS headquarters is located here in Cleveland, Ohio, with regional offices in Washington, D.C., Hyderabad and Bangalore, India.

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- Ongoing Monitoring of Network Performance





# Artists

June 22, 2019



## Madhuvanti Bhide

Hindustani Classical Vocalist, Madhuvanti Bhide, got a solid training for about 9 years, from her Gurus Dr. Alka Deo Marulkar, and Alkatoi's father Late.Pt. Rajabhao Deo.

She obtained her Bachelor of Performing Arts, from Lalit Kala Kendra, Pune University. She also received the prestigious Scholarship from the Govt. Of India. Madhuvanti has received Sangeet Visharad from Gandharva Mahavidyalaya, Pune.

Along with many awards, she was awarded the Gandharva Award at the Ayurvedic Association of Professionals in North America.

Madhuvanti's golden voice and poignant rendering is a powerful combination that captivates the audience wherever she performs. Resident of the Bay Area, Madhuvanti has given stellar performances throughout North America, India, Singapore and continues to do so. Madhuvanti has two published albums "Arpan", and "Ase Sur Gave". She enjoys and performs semi classical, hindi/ marathi light music. Madhuvanti enjoys training students of all ages. She continues to learn from her Guru, Dr. Alka Deo Marulkar.



## Amol Chiplunkar

Amol Chiplunkar is a self-taught keyboard and harmonium player. He has accompanied several musicians belonging to genres including Hindustani Classical, semi classical, Sufi, Bollywood and Fusion.

Amol enjoys performing live and collaborating with local talented artists whenever he gets an opportunity.

# Artists

June 22, 2019



## Satya Vaidyanathan

Satya has been playing tabla since his youth mostly as a self taught tabla player. Having being born and brought up in Chandigarh, he grew up with a very strong influence of hindustani classical and semi classical music. He began his pursuit of formal learning with Sh Muthu Kumar Varadharajan and is continuing his learning journey with Ustad Shahbaz Hussain. Both of Satya's guru's have been direct disciples of two of the doyens of the Panjab Gharana of Tabla - Ustad Alla Rakha Khan Saheb and Ustad Miyan Shaukat Hussain.

A former technology executive in the Silicon Valley, Satya is a musician and coach at his core. He is a practicing Leadership & Executive Coach. He founded YogaSukham - Wellness Village in Dublin, CA a year ago and now dedicates his full time to bringing wellness to the community by combining the power of Yoga, Meditation, Nutrition, Excellence Coaching & Music.



## Manoj Tamhankar

Manoj Tamhankar learnt basics of Harmonium playing from Shri Haribaba Khare of Guhagar in Konkan region of Maharashtra.

For last last 20+ years in the bay area, he has accompanied many artists from the bay area as well as had opportunities to accompany visiting well known artists from India such as Vidushi late Dr. Veena Sahasrabuddhe, Pandit Vijay Koparkar, Pandita Shalmali Joshi, Pandita Shubhada Paradkar, Dr. Alka Deo Marulkar, Vidushi Arti Ankalikar et al.

He has a keen interest in composing music and has 2 albums published to his music credit and has provided music to numerous

shows as well.

Alongwith his wife Archana, he also teaches Hindustani Classical music to the younger generation of the Bay Area.



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