Thank you very much for that glowing introduction, Dileeka.

Mrs.Sandamali Aviruppola, Principal of Visakha Vidyalaya, President of Visakha Vidyalaya OGA and Chairperson of the Pulimood Educational Trust;

Mrs. Sita Siriwardena and Members of the Pulimood Trust;

Distinguished Invitees;

Teachers;

Fellow Old Visakhians;Current Visakhians;

Scholarship winners;

Parents;and Well Wishers of the School,

Ladies and Gentlemen!

Good evening,

It is indeed a great honour for me to be standing here today to deliver the 28th Susan George Pulimood Oration, on Mrs. Pulimood's 111th Birth Anniversary. My humble thanks go to the Principal and the Pulimood Trust for honouring me with the invitation to deliver the Pulimood Oration, one of the most prestigious events of the school.

Let me start by paying homage to our beloved Principal,

Mrs. Susan George Pulimood – The visionary educationist

Mrs. Susan George Pulimood was the principal of our school from May, 1945 to January, 1967. I was lucky to be a pupil during the last few years of her reign, and benefit from the immense improvements she had brought about to the school. We had well equipped science laboratories for both O Levels and A Levels, a dedicated staff under her able guidance, and Visakha was indeed the premier educational institute for Buddhist girls in Sri Lanka.

I gained admission to Visakha Vidyalaya after passing the admission test to Form III in 1964, and our classes were on the upper floor of the same building as the principal's office. I remember her getting out of her green coloured car every day, and walking into her office, with a smile on her face, as we were outside during the lunch interval. Somegirls used to run up to her and say 'Good afternoon', a greeting which she returned, with a smile.

Though not very big in stature, she had such charisma about her that I believe she commanded respect from all the girls and staff effortlessly. She used to walk the corridors during school time, and randomly enter a class and talk to the teacher and students, always with a word of advice, or imparting a bit of her worldly wisdom to the young girls. One day, on one of those occasions, she taught us a verse, which I still remember:

'Let it not be said and said in shame,
Here was all beauty until you came'.

To me, that epitomises her expectation from each and every Visakhian. Make the world a better, more beautiful, place than you found it. It will be a shame to do otherwise.

I did not study the text book of Botany she co-authored with her sister, Miss Joshua, but I did have the privilege of meeting her several times as a member, and later the captain, of the school Spelling Bee Team. She used to call us into her office on certain days and check our progress. The first encounter of course was not a happy one for me, as I got pulled up for making some mistakes, which made me so nervous that I broke into tears; and then she told me to control my 'lachrymal glands', a word few of us knew, and taught us how to spell it! Although I felt she was quite unsympathetic at that time, in hind sight, I can really see how witty and clever at teaching she was!I don't think anyone in the team would forget how to spell it, according to the Oxford Dictionary! Later I realised how supportive she was of all the extra-curricular activities that the students participated in, and how she personally attended to matters in order to help us.

Her last few months at school must have been really hectic, as we participated in the 'Siyawasa' Exhibition, celebrating 100 years of free education in Sri Lanka at the Race Course. I cannot imagine what a lot of effort would have gone into the organization of the school stall, ensuring the quality to keep up the prestige of the school, as well as security of the girls and equipment, over a whole week, where the public were gathering in hundreds of thousands, from morning till evening. Her remarkable capacity for getting the support of the Ministry Officials, her own staff, parents and well-wisherswas evident in the way the exhibition was a thundering success, and she has been able to start a fund to build this hall.

These are the little things that in my mind set her apart from the rest. We missed her dearly when she left, in our Advanced Level years;although we need not have worried, as we were in the good hands of her successor, Mrs. Hema Jayasinghe.

Now let me get onto my topic for today:

"**Breaking Barriers and Changing the World – Women in Engineering"**

Gender stereotyping has been an ongoing practice in both the developed as well as developing world since time immemorial. Whilst some conservative cultures strictly enforce a differentiation between males and females in education, employment, and social freedom; even in more liberal cultures, stereotyping is still apparent from the day a child is born.

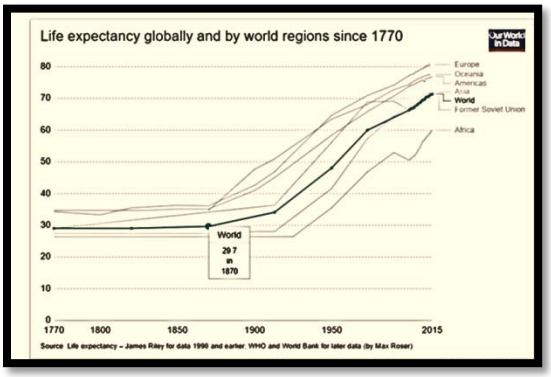
- Girls are dressed in pink dresses with bows and ribbons, expected to play with dolls, and are seen to be timid and weak; whereas boys are dressed in blue, expected to play with trucks and trains, and often complimented for being tough and rough.
- Boys should fix things while girls need things fixed. As girls grow up, they are expected to be beautiful, graceful, soft spoken, and cultured, whereas boys will be handsome, outspoken, and strong.
- Boys are expected to be strong in science and mathematics and girls strong in the Arts.
- Even if girls do get into science, they may study medicine or biological sciences, but rarely engineering. Boys will become Surgeons, Engineers, and Pilots, whereas girls will stay at home as housewives or take up jobs like nurses, primary teachers or secretaries. If they do become doctors, they are expected to select to practice in what are perceived as less challenging specialities. This is the typical stereotyping of roles given to boys and girls by society.

Since my childhood days, I have always challenged these stereotypes. Looking back at my time spent at this prestigious institution, I can see how my own views and attitudes were formed and influenced by strong female role models who also challenged society's lazy stereotyping of how a woman should live her life. Our school's founder, Mrs. Jeremias Dias, after whom this hall I address you incidentally is named, and Mrs. Susan George Pulimood, who I honour with my oration today, were not only pioneers in the advancement of girls' education in Sri Lanka, but were in their own right tremendously successful in running a top class educational institution for girls, thereby breaking barriers imposed by a patriarchal society.

Now I will move you away from my own personal experiences to a much more international scenario.

Let us look at how the world has changed during the recent past.

This slideshows how the life expectancy has changed globally, and in the world regions, during the past 250 years:



The average Human Life Expectancy has improved globally from a mere 29.7 years in 1870 to 72 years in 2016! Life expectancy in each region of the world stayed fairly stable for most of history until the onset of the "**health transition"**, the period in which life expectancy began to increase.

Who or what do you think caused this change?

The answer may surprise you.

True enough, the major cause is the improvement of people's health conditions. How did this happen? It was of course due to improved access to water and sanitation, better nutrition, better medicines, better medical diagnostics, better access to health facilities and hospitals, better surgical instruments and completely new life saving medical and surgical procedures and so on.

What is the single profession that is behind all these factors that not only made human life expectancy longer, but also made a huge improvement to the quality of life of people, all over the world?

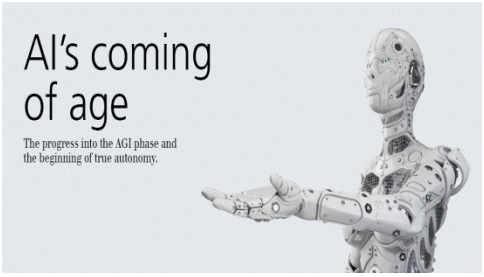
It is the **engineering profession**.

It is **theengineers** who design and build the water treatment facilities and water supply schemes to provide safe drinking water to people. It is the **engineers** who design sanitary facilities and waste water collection systems that keep the environment clean and healthy. It is the **engineers** who provide water for agriculture through irrigation and drainage systems to keep people fed;they manufacture pharmaceutical products that help prevention as well as curing of diseases that leads to disease and death. **Most of these advances in improving the services provided to people was possible because of the discovery of methods to generate and transmit electricity.**

A very important role is played by the doctors who diagnose diseases and treat them effectively, before it results in permanent damage to organs or evendeath. But without the diagnostic tools like CT scans, MRI scans, echo, ultrasound and other sophisticated equipment, this would only be a dream. Robotic surgical systems are becoming fairly common in the world now. And, as some of you must be aware of, and perhaps have already experienced, Artificial Intelligenceis revolutionizing the world, and is fast becoming a very important asset to doctors, in diagnosing and treating patients.

Slide 5

Slide 6



Slide 7

Slide 8

Another aspect of this improvement of living standards comes from the tremendous advances in transportation and communication. While the speed, comfort and safety of road, rail, air and sea travel has improved in leaps and bounds due to technological advances,this industry itself has been catalysed by advances in communication. Telecommunication, internet and unmanned aerial vehicles (or drones, as commonly called) have opened a brand new facet to life. Although there are concerns with respect to the indiscriminate use of these media, the beneficial uses seem limitless.

The beauty of all theseinnovative technologies is that they may be very expensive at the start, but become quite affordable within a few years, as production increases.

We become engineers because we get excited about solving problems and making things happen, by design. **Engineers change the world** – We improve human life by catering to the needs of society, providing solutions to facilitate everything from basic human necessities such as shelter, food, water, transportation, clothing, and medical equipment to fancy extravaganzas like Trevitas and Lamborghinis. We help advance cultures through providing platforms for entertainment and communication. We conceptualize solutions, design them, and implement them.

We also design and implement others' concepts, collaborating with architects, doctors, and scientists to create buildings, medical equipment, and laboratories. Engineers at NASA are working hand in hand with astronauts right now, designing and implementing their concepts for space travel to another planet! This list is endless. Without engineers, these concepts would remain merely as ideas.

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It is the engineer's role to design safe and functional solutions to all kinds of problems faced by others, and bring them to life. That is how Engineers are changing the world.

Of course, being a female in a male dominated field is apparently inconvenient to many people.

To illustrate this social dilemma I'd like to draw your attention to an interesting quote I came across. *"Female engineers have been termed double stereotype breakers; that is, we break the stereotype for a 'good woman' as well as that for a 'good engineer' "*

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I do not see being a woman as a handicap for being an engineer. Family and school support is extremely important for any girl taking this step. Visakha Vidyalaya has always empowered girls to take on challenges and do what they are best at, not being confined to stereotypes. This foundation helps a girl to confidently enter a male dominated field and still be a 'good woman'; beautiful, graceful, eloquent, and cultured.

You don't have to be a 'Tomboy' to become a good engineer. In fact, during my career of 43 years as an academic at University of Moratuwa, I have seen very few girls who wanted to look like boys or act like boys. Gaining the right skills and having the passion for what you do, and the confidence to take up challenges put in your path, are the important factors to be successful as a female in engineering.

Females bring something to a team that is lacking in an 'all-male' society.

I wonder if anyone has seen the movie "The Female Brain" or read the book by Dr. Louann Brizendine, on which the movie is based. Somewhere in it the doctor says:

'Male and female brains are wired very differently. More than 99% of male and female coding is exactly the same. Out of the thirty thousand genes in the human genome, the less than 1% variation between the sexes is small; but that percentage difference influences every single cell in our bodies.

Male brains are larger by about 9%, even after correcting for body size. In the nineteenth century, scientists took this to mean that women had less mental capacity than men. However, now it is understood that both sexes

have the same number of brain cells, but the female brain cells are packed tighter into the skull. With the advances in genetics and new tools like PET scans and fMRI (functional Magnetic resonance Imaging) scans, now it is possible to see inside the human brain in real time, while the brain is used by the human for various functions, like solving problems, producing words, retrieving memories, noticing facial expressions and having feelings like depression, fear, anxiety, love or sympathy. The male and female brains process stimuli, hear, see, "sense" and gauge what others are feeling in different ways.Some parts of the brain, like the brain centres for language and hearing, as well as emotion and memory formation, are larger in women.

Girls being emotional, sensitive, hypervigilant, - qualities considered as weaknesses, are actually not a bad thing. Stereotypical female characteristics are actually strengths. For example, we are hard wired to identify danger."

Not only the brain, it was with some astonishment that the world learned, just 25 years ago, that women's heart disease manifests itself differently to men's too! And rather than dwelling on our differences, the time has come to embrace the unique qualities women have to offer.

The benefits of female participation in fields like product design are being recognized now. A recent article by Sue Williams titled 'Why we need women in STEM'(that is, Science, Technology, Engineering and Mathematics), describes this advantage.

She says "As more women enter the fields of STEM, we are seeing the difference a women's perspective makes. For instance, engineer Surbhi Sarna of 'nVision' is developing a technology to detect ovarian cancer and tube blockages, which would improve a century-old procedure that is painful to the patient. Amy Sheng, a mom and bioengineer, is working on 'CellScope', which allows parents to use a smartphone attachment to diagnose children's ear infections. Leah Sparks and Katherine Bellevin have created 'Due Date Plus', a smart phone-enabled maternity program.'

These are products that improve the quality of life of the people, which, probably men would not have thought about. Another aspect of development that female engineers are contributing to, in a significant way is in the social and environmental aspects of engineering works. As given in the earlier

quote from the 'female brain', the sense of threat to safety and security is much higher in females, which can positively contribute in the implementation of projects. This factor is being recognized in the developed world nowadays.

Looking at some of the pioneering women engineers of Sri Lanka,

SLIDE11

- The first female to enter the Engineering faculty (those days there was only one) was Ms. Premala Sivaprakasapillai. She entered the faculty in 1960, the same year as our country produced the first ever female elected head of state in the world, Mrs. Sirimavo Bandaranaike. Premala graduated in 1964, as a Civil Engineer with first class honours.
- The first Sri Lankan female electrical engineer, Ms. Sumi Senanayake (Moonesinghe) graduated in 1968 and
- the first ever Sri Lankan female Mechanical Engineer, Ms. Indira Arulpragasam (Samarasekera), graduated with me, with first class honours, in 1974

The first Visakhian to study engineering, by the way, is Nimala Ramanayake (Pieris) who entered the Faculty in 1965, and had a very successful career as a Design Engineer at the Highways Department.

We have had female engineers who have risen to the top of their careers, 'manning' huge engineering organizations.

- In 2000, Ms. Lanka Haturusinghe became the first ever female President of the Institution of Engineers, Sri Lanka. – In an institution which has its origins in 1906, it took us 94 years to achieve that!
- In 2009, my batch mate, Badra Jayaweera (Badra Gunasekera, a Visakhian) became the General Manager of the Ceylon Electricity Board.
- In 2012, Badra Kamaladasa, a product of University of Moratuwa, became the head of another major engineering organization, Director General of the Irrigation Department.

These are some of the trailblazers who have broken barriers and done what they had the passion to do.

I thought it would be good to share with you the sentiments expressed by a fewfellow Visakhians who have overcome impediments to rise to the forefront of their chosen careers.

(video clips)

- Dr. Mrs. Dulini Mendis, a first class graduate in Electronics and Telecommunications Engineering who just completed her PhD at University of Melbourne and started her professional career:

- Mrs Tharangika Jayasundara, a Senior Structural engineer in the Central Engineering Consultancy Bureau (Who is seated in the audience right now):

- Dr. Samantha Gooneratne, who studied Chemical Engineering at The University of Cambridge and has chosen a career in university academia in the UK

- And lastly, Ms. Nilupuli Andrahennadi, who has followed her dream and showed that the sky is the limit for a Visakhian, by joining the crew of Sri Lankan Airlines as a pilot.

I speak to you today as a Professor Emeritus in Civil Engineering of the University of Moratuwa, as well as the current President of the Institution of Engineers of Sri Lanka. I was the first female to achieve this combination, but I am hopeful I am merely the start of a long line of many more to come.

Recently we did a study among the female engineers of the IESL. Incidentally, we have a total current membership of 15,500, all qualified engineers, out of which 2290 are female engineers, which is about 15%.

Our questionnaire went to all the female engineers, out of whom about 20% responded. Greater majority of them (88%) are working full-time in the government or private sector, and 25% have postgraduate qualifications too. We got some revealing statistics from that survey, on which we need to take some initiatives at the IESL, to improve the lot for the women engineers.

Just to give a glimpse about the situation among female engineers in Sri Lanka,

- When asked if they feel that engineering is a Man's World, 91% said no; but 71% said that women face more opposition in leadership roles than men.
- With regard to the workplace environment, when asked if they get treated equally by their engineering colleagues in the work place, a little over half (54%) said yes, while about one third (30%) said No; Getting respect from the non-engineering male staff at the workplace, some female engineers feel that they are treated better than the male engineers. However, nearly a quarter said that they are treated with less respect than the male engineers.A large majority (77%) say that some men do not feel comfortable with having to report to women.
- While 78% say that having more females in leadership positions in the work place encourages them to succeed more, **71% say having a mentor (male or female) help them to succeed.**
- **61% think that there was (or will be) a time in their engineering career they had (or will have) to choose between**

family and career,and of them 52 % chose, (or will choose), family.

So we can see that although in Sri Lanka, there does not seem to be any barrier to study engineering (the current university intakes being totally impartial to gender), when it comes to the work place and home front, there may be barriers that have to be overcome to rise to the top.

For example, three quarters of the female engineers in the study, feel that the male employees resent having to report to female bosses. Majority feel that a male or female mentor would help them to succeed. A point where support is really needed is when the woman engineer has to choose between career and family, where slightly more than half who have either faced orexpect to face this situation, have said that she would chose family over career.

These findings are in line with what is found in most other parts of the world too. There are various initiatives taken by other countries like New Zealand, UK and Australia to encourage girls to become engineers, and also to support the women engineers so that they can stay on in their jobs and contribute to the economy, with less impact on the family life due to their career, particularly at the young age.

On the positive side, most of these women engineers are doing very well in their careers, as they have **chosen**to do engineering, rather than just go along with the wave.

So, in summary, engineering is an exciting, 'people serving'profession, where we can rally change the world into a happy, livable place, working with other professionals to make their dreams come true. Girls can not only do it well, but females bring a very important dimension to engineering because of the way we think and act.

There are certain barriers to women getting into the fields that are stereotyped as men's jobs, in the patriarchal society we live in, but these barriers can be broken if you develop the right skills and have the passion for it.

I will be failing in my duty if I did not acknowledge some very important people who helped me to deliver this address.

- First and foremost,Principal of Visakha Vidyalaya, Mrs. Sandamali Aviruppola and Mrs Sita Siriwardena, Srimathi Jayasuriya and other members of the Pulimood Trust
- Old Visakhians: Dulini, Tharangika, Samantha and Nilupuli for taking the effort of producing the video clips
- Eng. Dr. Mrs. Achela Fernando of New Zealand and Mangala Wickramanayake of Sri Lanka Ports Authority for conducting the survey among our female engineers and sharing the data
- Eng. Ms Lanka Haturusinghe who gave me information of the pioneering women engineers
- Eng. Mrs. Shyama Gunawardena and the Committee of the IESL Women Engineers' Forum
- Internet resources used in the preparation of this presentation
  https://www.inc.com/sue-williams/why-we-need-women-in-stem.html;
  http://wie.ieee.org/;http://societyofwomenengineers.swe.org/; https://ourworldindata.org/life-expectancy
- eBook "The Female Brain" by Louann Brizendine M.D., published by Transworld Books.

To end, I leave you with this statement by Stacey DelVecchio, Past President, Society of Women Engineers, USA, which nicely sums up the sentiment most of us women engineers feel at work as well as when we meet people socially.

"I wish people would stop being impressed by the fact that I'm a Woman Engineer. We want it to be <u>normal</u> to see beautiful, social, intelligent women out there that are engineers"

To all the parents and teachers in the audience, I urge you to help your daughter and pupil to find her passion, be it Engineering, Business, Surgery, or anything in between, encourage her to break all barriers she comes across, and not let stereotyping stop her from changing the world into a better, more beautiful, peaceful and happy place to live in.

May the blessings of the triple gem be with you.

Thank you.