Transformation in Education
A journey through time into the future'.

I commence with an 'Advanced Organiser' for learning and retention of unfamiliar. Ausubel, D. P. (1960).

This is an international conference, so, I could first consider Indian philosophy, thought by many (particularly those from the Indian sub-continent) to be the earliest philosophical work, Buddhism and Yoga that are still very much with us or I could look back on the Chinese contribution of the "Hundred Schools of Thought" that flourished from the 7th to 2nd century BC). I simply give a hand out of references.

I have chosen, as my starting point, ancient Greek philosophy developed in the 6th century BC and continued as a part of the Roman Empire. This leads to Western Education, as known today.

The noun philosophy means the search for wisdom. The word comes from the Greek roots philo- meaning "love" and -sophos, "wisdom." Every PhD, up to today, should make an original contribution to knowledge and wisdom.

A particularly notable, early Greek philosopher was Hippocrates, a physician born in 460 BC. He became known as the 'Father of Medicine'. His Hippocratic Oath is still valid and taken by physicians to uphold ethical standards.

But the three great philosophers who really made ancient Greek philosophy famous were: Socrates (470BC) who was Plato's tutor and Plato (428BC), who taught Aristotle (384BC). Plato set forth his philosophy in dialogues but he also founded the 'Academy (c. 387 BC), probably the first institution of advanced learning in the western world. A famous educational passage in Plato's works—occurs in the Meno, giving no information to a slave boy – and only by questioning him, the boy proceeds to solve a geometry problem.

Aristotle (394BC) is a towering figure in ancient Greek philosophy, apart

from his contributions to logic, all the then sciences, politics, dance and theatre. He identified the classic four elements—earth, water, air, and fire—as the building blocks of the universe.
He founded the ‘Lyceum’ the second known institute of higher earning.

This was a forerunner to Europe’s first University, the University of Bologna, Italy 1088, the oldest university in continuous operation, as well as still being one of the leading academic institutions in Europe. It was the first place of study to use the term universita. The handout prints the oldest eight in Europe –four in Italy!
By the year 1500 approx. 80 universities were established in Europe. Today, in UK alone, there are 130.

By the 15th Century the period known as the 'renaissance' began, from the French word meaning 'rebirth'. It is used to describe this phase of European history because many of the changes experienced between the 14th and 16th centuries were inspired by a revival of the classical art and intellect of Ancient Greece and Rome.

A most important landmark of this period was Leonardo da Vinci 1452 - 1519. He was an Italian High Renaissance polymath whose areas of interest included science, invention, music, mathematics, engineering, literature, anatomy, geology, astronomy, botany and painting, e.g. the Mona Lisa,

Another critical advance was the invention of the printing press by a German, Johannes Gutenberg in the mid 15th Century. In England, William Caxton, a contemporary of Johannes Gutenberg is credited with being the first person to introduce a printing press in 1476 to retail printed books. These had huge educational implications. The book ‘The Printing Press as an Agent of Change’ gives a full historical treatment and its importance as an agent of change.

During the reign of Queen Elizabeth 1st 15th/16th century, there was no compulsory schooling. However, the Renaissance ideas spread from the continent, included the idea that society could be improved through education and learning. The ability to read and write became a highly

desirable asset. The Universities of Oxford and Cambridge expanded and numerous schools were opened. The Inns of Court in London where lawyers were trained was regarded as a third university.

During the time of Charles 2nd 1630–1685 scientific research developed rapidly. The king backed scientific experiments – and the Royal Society was born. Today, there are approximately 1,600 Fellows, 80 of whom are Nobel Laureates.

The Industrial Revolution, taking place during the 18th/19th centuries, was a period in which many rural areas became industrial and urban. Again, educated manpower was required for industrialization, the Interaction with Universities, equated to strong growth in universities.

Since the 1900's Education has transformed even further. In the UK, Education was made compulsory for all to 16. In virtually every level and branch of University learning, research has been vast but particularly in technology and sciences e.g. in 1901 Wilhelm Röntgen, received the first Nobel Prize ever. It was in Physics 1901 for creating an invisible ray; now known as an X-ray.
Marie Curie, a naturalized French physicist and chemist, conducted pioneering research into radioactivity. She was the first woman to win a Nobel Prize, the first person and only woman to win twice in two different sciences.

Where are we now and what may be the future?
Within living memory further medical advances have been immense examples from so many, Sir Alexander Fleming, Professor of Bacteriology at London University, received the Nobel Prize in Medicine 1945 for his discoverer of penicillin, the first true antibiotic.
Christian Barnard (1922 --2001) was a South Africa cardiac surgeon who performed the world's first human heart transplant in 1967.
Albert Einstein, the theoretical physicist, developed the theory of relativity,
Stephen Hawking, who recently died, his space research benefits humanity on Earth with advances in medicine, biotechnology and the physical sciences.

I would now like to briefly mention two books that cast shadows over our future and were written concurrently with scientists such as Christian Barnard and Sir Alexander Fleming.

First, Aldous Huxley's Brave New World, his book looked into the future, what he predicted in 1932 is becoming painfully close to reality in practice with 'soma', a drug that confers instant bliss and has no side effects, promiscuity that rids all of any sexual frustration. During the gestation period embryo babies travel in bottles along a conveyor belt. All are conditioned to belong to one of five castes: Alpha, Beta, Gamma, Delta, or Epsilon. All are happy with their place in life.

The second is George Orwell's of 1949, titled Nineteen Eighty-Four. It gives us a picture of a brutal, mind –controlling totalitarian state not unlike Stalin's and one or two other countries that currently delight in enforcement through 'brainwashing' Orwell's book is a fusion of political and artistic purpose. Of political language, he writes, 'Political language is designed to make lies sound truthful and murder respectable, and to give an appearance of solidity to pure wind'. Both books reflect issues that are very much with us, today.

With the myriad of medical advances I wonder what Hippocrates would think now as he passed in the street where individuals have hip or knee replacements, stents in the heart, implant teeth, transplant kidneys, others take pills for heart problems, diabetes, blood pressure, an endless list. There are now more than six and a half million born by IVF. Certainly, Hippocrates would realize that there is an internationally divided medical profession for the interpretation of his Hippocratic oath. I suspect medical opinions will diverge further as ethical and legal problems become more complex. The Hippocratic oath, taken by dentists, includes the promise to do no intentional harm to patients!!

A paper given at the American Association for the Advancement of Science in February indicated that organs grown in animals may be available for transplant within the next ten years to cure diabetes.. Stem cell research expects that within ten years some blind will see.

Recent measures of various cancer survival rates have increased from five years to 10 years.

How do these many advances affect the university population? Clearly, a need for even greater thrust for research, linked to teaching for an optimal outcome. Research costs money - In UK Universities the most recent figure available approx. £8,000, million per annum and still short of cash! Centres of excellence get major shares e.g. Cambridge, Kings College, London, in the main, the old UK Universities. University medical research and teaching will improve both the quality of life and 'Life Expectation'. In UK current Life Expectation is 82 years. It is predicted that by 2030 it will be in the late 80's i.e. an additional 5 years. Longer pensions have to be paid for. The question, How!

This problem has already caused strife/strikes in UK Universities this year. It may entail that individuals may have a longer working life and b) for many, to retrain for a second career. Despite successful medical research, the older a person is more likely to suffer with chronic conditions such as dementia, diabetes and arthritis. The economic implications for an aging population are huge. The School of Public Health, University of Illinois recently estimated the U.S. would be spending $3.2 to $8.3 trillion more than currently projected.

Another variable of immense importance for Universities in the next decades is Artificial Intelligence (AI). It will be one of the defining features this century.

The Chess game Robot, 'AlphaZero' won or drew all 100 games, against Grand-masters, having 'Started with no knowledge except the game's rules.

Stephen Hawking said, 'Artificial intelligence could wipe out humanity when it gets too clever, humans will be like ants. AI would take off on its own, and re-design itself at an ever increasing rate'

I prefer to take a more optimistic view as far as Human versus Robotic behaviour. Even with the major advances that will be made, I believe AI

will come nowhere close to people in terms of perception, reasoning, communication, creativity and mobility. AI has no social intelligence 'No soul' and the greatest difficulty with unfamiliar combinations of ideas. These restrictions, I suggest will hold it back from any automated system "out-thinking humanity" in any overall sense. At the same time, I understand the legitimate concern about automation displacing jobs, and think it imperative that we address the ways that emerging technologies will affect the economies of the future. The reality will be, I hope, that the nature of work keeps evolving as new technologies take over some tasks and create more time for others, just as machines transformed the world of agriculture a century ago.

However there is an important caveat, Human versus Human, with AI as the modern weapon. Vladimir Putin recently warned, 'Whoever leads in AI will rule the world'. All ripe for exploitation of Drones to missiles, Fake videos for propaganda, automated hacking, all are the malicious use of artificial intelligence

There is a further, sinister development of AI, its use in organised crime, the old problem of good versus evil. UK Serious Fraud Office announced last month that in all new cases, a Robot would be used to sift evidence; currently it is 2000 times faster than any human lawyer. Frances Gibb, Times, April 2018.

It will be up to United Nations supported by Universities, politicians and the broader community to control catastrophic abuses of AI. Put succinctly, 'The only thing for the triumph of evil is that good men do nothing' - attributed to Edmund Burke (1729 -1797).

Another problem in universities is Plagiarism, at all levels, but particularly serious for the PhD. This is covered well on line www.ox.ac.uk Academic good practice – a practical guide. I believe that AI will revolutionize the University examination system. Currently, within Europe, there are over 20,000,000 tertiary education students (those over 18 years). Artificial Intelligence will facilitate a more systematic, cost-effective manner of research, teaching and examining, allowing Universities to have have a more flexible approach, developing with a

wider range of study options to study online, providing a combination of studies with work or family commitment.

My final two points relate to gender and accessibility of less privileged.

In Vernon's 1959 paper on the 'pool of ability', he stressed the necessity to use the national pool. In 1959 female participation in the professions was in its infancy. Hence, only a small % of the female 50%, of the population was used. It was only in 1948 that women were allowed to graduate at Cambridge University, over 700 years after the University's Foundation. In the mid 1980's, I remember chairing a Committee in London University to appoint a Professor. I started with 'Gentlemen, all things being equal, we shall appoint a lady this morning'. We did and this doubled our female professorial representation in the Institute concerned.
Equality of opportunity should also spread across the total socio-economic range of all, globally. Currently, regrettably, in UK, an upward aspirant 18 year old from a poor family often considers the cost of tuition too high. They have the potential but are largely denied the opportunity at a consequent loss to the person, society and economy.

In summary, as educationalists and professionals, our response should be similar as in previous technology waves - to prepare young people, and ourselves, for the development and change in occupations and technologies, making individuals more productive and doing less mundane tasks by using the benefits available.

Clearly with 3,500 years to draw upon, I could continue to talk for the rest of the day. Regrettably, I cannot - but probably not regrettable to you. I do have time for 1 or 2 questions, and one quote from the past.

'Perform all work carefully, guided by compassion' (Ved Vyasa 1,500 BCE)

Thank you