INTRODUCTION
Human body can't regenerate a missing leg or a finger, but it constantly generates blood, skin and other tissues. These powerful cells which allow us to regenerate some tissues are called stem cells. They were first discovered in the 1950s when experiments with bone marrow established their existence.

Ultimately, every cell in the human body can be traced back to a fertilized egg (refer to Fig. 1) that came into existence from the union of egg and sperm. The 200 different types of cells, which make up the human body, come from a pool of stem cells in the early embryo. These embryonic stem cells give rise to the specialized cells that carry out specific functions of the body, such as skin, blood, muscle, and nerve cells.

The ability of the stem cells to develop into different types of cells is known as the potency of stem cells. As shown in the table below, stem cells are classified into four types based on their potency. Classification of stem cells can also be based on the location where they are found. Stem cells gathered from the embryo are known as embryonic stem cells while those obtained from an adult body are called adult stem cells. One can refer to the table below to know all the different types of SCs.

POSSIBLE APPLICATIONS OF STEM CELLS
Stem cells possess huge potential to provide solutions to many biological problems which scientists face today. Below are some of the possibilities.

Tool to give insights into embryo development - Human stem cells may allow scientists to investigate how early human cells differentiate to form the myriad functional cell types, which underlie normal function in the adult. The human embryonic stem cells can greatly accelerate the understanding of the causes of birth defects, thus directly leading to their possible prevention.

Models to better understand human disease - In order to know how a disease develops, scientists require animal models. Current animal models of neurodegenerative diseases such as Alzheimer's disease give only a partial representation of the disease's process. Further, a number of pathogenic viruses including human immunodeficiency virus and hepatitis C virus grow only in human or chimpanzee cells. Stem cells can provide required cell and tissue types to speed up such investigation.

Organ Transplantation - Pluripotent stem cells could be used to create an unlimited supply of cells, tissues, or even organs that could be used for transplantation. Since the stem cells would be acquired from the individual requiring the transplant, there would be no requirement for immune-suppression and concerns over tissue matching compatibility.

Curing diseases - any nervous system diseases result from loss of nerve cells. Mature nerve cells cannot divide to replace those that are lost. Thus, without a new source of functioning nerve tissue, no therapeutic possibilities exist. In Parkinson's disease, nerve cells that make the chemical dopamine die. In Alzheimer's disease, cells that are responsible for the production of neurotransmitters die. In spinal cord injury, brain trauma, and even stroke, many different types of cells die or are lost. The potential of pluripotent stem cells to create new nerve tissue possessing the desired functionality is currently the only hope for treating such individuals.

Skin Grafting - For many years, scientists have been harnessing the regenerative capabilities of human skin to treat victims of severe burns using skin transplants. Skin transplants are possible because of the existence of stem cells located just under the top layer of skin. Now, scientists can grow vast sheets of new skin by culturing the stem cells from small pieces of
healthy skin. Thus engineered skin, through stem cells, can create more natural-looking skin transplants.

CONTROVERSY SURROUNDING STEM CELLS
There exists a widespread controversy over human embryonic stem cell research. The questions at the center of the controversy concern the nature of early human life and the legal status of the human embryo. Embryonic stem cell research often involves removing the inner cell mass from excess blastocysts (refer to Fig. 1) that are unneeded by couples who have completed their fertility treatment. Although such blastocysts would likely be discarded by the clinics in any case, some believe that this does not make it morally acceptable to use them for research or therapeutic purposes. Some cultures and religious traditions oppose the use of human life as a means to some other end, no matter how noble that end might be. Other traditions support embryonic stem cell research because they believe that the embryo gains the moral status of a human being only after a few weeks or months of development. Many traditions emphasize obligations to heal the sick and ease suffering—goals for which embryonic stem cell research holds great potential—and favor embryonic stem cell research for this reason.

To avoid controversies, efforts have been made to develop pluripotent cells from adult body cells. By inducing a forced expression of 4 key genes for genes for pluripotency, induced pluripotent stem cells (iPSCs) can be obtained from adult mice cells. However, this carries a risk of triggering cancer-causing oncogenes. Although, currently iPSCs cannot be considered as complete replacement of human embryonic cells, better methods will hopefully be developed in the future.

STEM CELLS PATENTABILITY
The United States Patent and Trademark Office (USPTO) states that purified and isolated stem cells are patentable subject matter. According to the USPTO, stem cell products and research tools meet the three criteria for patentability: novelty, utility, and non-obviousness. Patent filing activity in stem cells has been growing steadily since the late 1990s. Given the particular characteristics of stem cells as a broadly enabling technology, many expect the field to be particularly susceptible to the emergence of a patent thicket. A relatively small number of patents cover the most fundamental technologies on which most stem cell R&D is dependent. These are the technologies that inform and support the wider field, and these patents have proportionately greater potential for blocking commercialization of a range of stem cell applications. The WARF (Wisconsin Alumni Research Foundation) patents, claiming all primate and human embryonic stem cell lines, embody one of the strongest possible property claims in the field of stem cells, establishing control at the very root of all possible lineages of cellular differentiation.

Fig. 2 shows the broad trends in stem cell patenting. In the mid 1990’s, as the rate at which the USPTO granted patents on stem cells increased rapidly, there was a steep increase in the number of US and PCT applications filed. Similarly, when the rate of grant declined, the number of filings also decreased after peaking in 2003.

CONCLUSION
As stem cells have come to the forefront of medical research, the ethical controversies over embryonic stem cells have become prominent. The advancement of science has transformed our lives in ways that would have been unpredictable just half a century ago. Whether stem cell research will have a similar effect remains to be determined, but the promise is so great that it seems wise to consider seriously how best to further such research in a manner that is sensitive to public sensibilities.

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- Shahzeb Akhtar
For more information, please contact

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</tr>
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<tbody>
<tr>
<td>Texas</td>
<td>100, Congress Avenue, Suite 2000, Austin, TX 78701</td>
<td>+1 512 469 5517</td>
<td></td>
</tr>
<tr>
<td>California</td>
<td>Suite 200, 530 Lyton Avenue, Palo Alto, CA 94301</td>
<td></td>
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<tbody>
<tr>
<td>Bangalore</td>
<td>iRunway India Private Limited, 1st Floor, AMR Tech Park I Annexe, Nos 23 &amp; 24, Hongasandra, Hosur Road, Bangalore 560068</td>
<td>+91 80 405 840 00</td>
<td>+91 80 405 840 10</td>
</tr>
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