

Professor Thomas Ming Swi Chang, O.C., M.D., C.M., Ph.D., FRCPC, FRS[C], FCAHS

BRIEF 2 page C.V. (2022 Oct 1) Complete CV at www.artcell.mcgill.ca/ChangPub.pdf

Degrees

- 1957 B.Sc. Honours Physiology McGill University (invented artificial Cells)
- 1961 M.D.,C.M. Faculty of Medicine, McGill University
- 1965 Ph.D. (on artificial cells) McGill University
- F.R.C.P.C. Fellow of the Royal College of Canada (Medical Sciences)
- F.R.S.C. Fellow of the Royal Society of Canada
- F.C.A.H.S. Fellow of the Canadian Academy of Health Sciences

Academic positions

- Promoted at 3 year intervals from assistant professor (1966) to associate professor (1969) to full professor (1972). Departments of Physiology, Medicine and Biomedical Engineering, Faculty of Medicine & Health Sciences, McGill University, Montreal, Quebec, Canada
- He requested the faculty to appoint him as emeritus professor in 2007 so that in addition to his teaching and research activities at McGill he can also fulfill the following activities:
- Director, Artificial Cells & Organs Research Centre, an international center
www.artcell.mcgill.ca/centrechart.pdf
- Elected Honorary President and coordinator, Int Soc Artificial Cells, Blood Substitutes & Biotechnology (an international network) www.artcell.mcgill.ca/ISABI.pdf
- Editor in Chief 1980-2020, Emeritus Editor since 2020 Artificial Cells, Nanomedicine & Biotechnology, an international Journal, (Taylor and Frances Publisher)
- Editor in Chief since 2006 Book series on Regenerative Medicine, Artificial Cells & Nanomedicine, World Science Publisher/Imperial College Press,
- Director, " Father of Artificial Cell TMS Chang Academician Specialist Research Station" First Hospital of the Shantou University Medical School.
- Honorary Professor, Peking Union Medical College, Chinese Academy of Medical Sciences, China
- Honorary Professor, Blood Transfusion Institute, Chinese Academy Medical Sciences, China
- Honorary Professor, Nankai University, China

Publications www.artcell.mcgill.ca/ChangPub.pdf

- He has published more than 560 full papers and chapters and many books
- More than 500 invited lectures and plenary lectures

Other recognitions for his research www.artcell.mcgill.ca/ChangPub.pdf

- He was awarded Officer of the Order of Canada for his invention of artificial cells
- A worldwide poll voted him the "Greatest McGillian" out of 700 nominee from McGill's 190 years history
<http://www.medicine.mcgill.ca/artcell/voting%20result.pdf>
- Nominated four times for the Nobel Prize
- Other awards www.artcell.mcgill.ca/ChangPub.pdf

He is known as the "Father of Artificial Cells".

- He proposed and prepared the first artificial cells (Chang McGill 1957, Science 1964, Nature 1968, Nature 1971) and continued this research for the rest of his research career with 560 full papers.
- In his Invited **Monograph on Artificial Cells (Chang 1972)** (Charles C Thomas Publisher). he stated that: "Artificial Cell is not a specific physical entity. It is an idea involving the preparation of artificial structures for possible replacement or supplement of deficient cell functions. different approaches can be used to demonstrate this idea." This has progressed beyond his 1972 predictions.
- **His 2019 review on Artificial Cells** <https://www.tandfonline.com/doi/full/10.1080/21691401.2019.1577885>
Titled "ARTIFICIAL CELL evolved into nanomedicine, biotherapeutics, blood substitutes, drug delivery, enzyme/gene therapy, cancer therapy, cell/stem cell therapy, nanoparticles, liposomes, bioencapsulation, synthetic cells, cell encapsulation/scaffold, biosorbent/immunosorbent hemoperfusion/plasmapheresis, regenerative medicine, encapsulated microbe, nanobiotechnology, nanotechnology". The potential of artificial cells in biomedical research and clinical application is only limited by one's imagination. An entirely new horizon is waiting impatiently to be explored.

Further details: Public service website www.artcell.mcgill.ca free papers, reviews, videos etc. including Monographs and books on Artificial Cells and related configurations.

ARTIFICIAL CELLS: WHAT? HOW? WHEN? WHERE? WHO?

Greatest McGillian in the university's 190 years history A 2011 worldwide poll voted the inventor of artificial cells, Chang, as the-“Greatest McGillian” out of 20 finalists from 700 nominee in McGill University's 190 years history. <http://www.medicine.mcgill.ca/artcell/votingresult.pdf>

The Canadian Academy of Health Sciences "Dr. Chang's original ideas were years ahead of the modern era of nanotechnology, regenerative medicine, gene therapy, stem cell/cell therapy and blood substitutes. Evidence of his stature within the international scientific community was confirmed by 2 nominations for the Nobel Prize".

United Kingdom journal, New Scientist: In 1957, Thomas Chang was completing his final year as an undergraduate at McGill University in Montreal. ... He would make the first artificial cell...has grown into a dynamic field...worldwide ...artificial cells is now a sophisticated marriage of microbiology, chemistry and biotechnology, the concept remains as straightforward as Chang's original notion. Theoretically, an artificial cell can contain virtually anything: oxygen, drugs, enzymes, antibodies, cell extracts and even cells themselves...can now create artificial cells with roughly 30 different polymers, as well as several kinds of proteins.in 1961(Bangham) also added lipids to the list"liposomes"

Journal of the British Royal Society of Chemistry , "Chemistry in Britain": Professor Tom Chang.....when he started work in the 1950's he was ploughing a lone furrow. Chang is credited with inventing microencapsulation, can emulate both in vitro and in vivo the behaviour of some natural cells."Artificial cells" already have many medical applications. chronic renal failure, drug poisoning, liver failure, enzyme therapy and metabolic function replacement. He told Chemistry in Britain: "When I first started work it was considered too far-fetched, but by 1966 when I demonstrated the value of artificial cells in hemoperfusion and detoxification there was a surge in interest and curiosity. ... interest in artificial cells and especially modified hemoglobin as a blood substitute has taken off".

"American Medical News(American Medical Association)" (Mark Moran):

"For nearly 40 years, Dr. Chang has pursued the development of artificial blood, and his work has laid the foundation for products that may be available in coming years. These products, however, are not true red blood cells but modified hemoglobin molecules for short-term transport of oxygen. Today, Dr. Chang is working on products that more closely resemble nature's own creation"

"Blood Weekly",U.S.A.: "The conference (VI International Symposium on Blood Substitutes) coincides with the 40 year anniversary of Chang's initial efforts back when he was a student at McGill University. This started ... the modern approach of red blood cell substitutes

Modern Drug Discoveries, ACS Publications: "The first encapsulated cells were developed as far back as the 1960s, when T.M.S. Chang and colleagues first reported the microencapsulation of cells. The vision of using these cells for therapeutic purposes was present from the start

Nature Medicine, "Cell encapsulation: promise and progress" G. Orive et al

"In 1964 Chang (Chang. **Science** 146(3643):524-525) proposed the idea of using ultrathin polymer membrane microcapsules for the immunoprotection of transplanted cells and introduced the term "Artificial Cells" to define the concept of bioencapsulation. Since then ...bioencapsulation has provided a range of promising therapeutic treatments for diabetes, hemophilia, cancer and renal failure".

From 50th Anniversary Special Gold Edition of the Official Journal of The American Society for Artificial Internal Organs The 1966 paper by Chang is one of the 25 landmark papers selected for this Gold edition. The editorial "...Chang is the originator of artificial cells...for medical applications such as Artificial kidney, artificial liver, detoxification, enzyme therapy... artificial blood field on hemoglobin type products. (Others included Kolff, inventor of artificial kidney; Scribner for chronic hemodialysis; Gibbon on heart-lung machine; Cooley first human implant of artificial heart; Kantrowitz on intra-aortic balloon pumping; Kolobow on oxygenator) Written for those with no scientific background

Artificial Cells by Marie Walker, McGill Tribune 2022 for all with no need for science background
<https://www.mcgilltribune.com/sci-tech/artificial-cells-offer-hope-for-covid-19-cancer-patients-04102022/>