

TWO PAGE EXECUTIVE SUMMARY (July 18 2024)

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

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
- 2023 D.Sc.honorary, University of British Columbia
- 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
- D.Sc. (honorary from University British Columbia)

Academic positions

Promoted at 3-year intervals from assistant professor to associate professor to full professor of the departments of Physiology, Medicine and Biomedical Engineering, Faculty of Medicine & Health Sciences, McGill University, Montreal, Quebec, Canada

McGill only allows full professors to have a limited amount of time for activities outside the university. I requested to be appointed emeritus professor so that I can fulfill the following activities:

Director, Artificial Cells & Organs Research Centre, an international centre

www.medicine.mcgill.ca/centrechart.pdf

Elected Honorary President and coordinator, Artificial Cells, Blood Substitutes & Biotechnology (an international network) www.medicine.mcgill.ca/ISAB.pdf

Editor in Chief 1980-2020, Emeritus Editor 2020- Artificial Cells, Nanomedicine & Biotechnology, an international Journal, (Taylor and Francis Publisher)

Editor in Chief 2006- Book series on Regenerative Medicine, Artificial Cells & Nanomedicine, World Science Publisher/Imperial College Press,

Editor in Chief 2024 International Journal Cell/tissue Engineering, Artificial Cell & Regenerative Medicine

Director, " Father of Artificial Cell TMS Chang Academician Specialist Research Station" First Hospital of the Shantou University Medical School.(Shantou is my home town.

Honorary Professor, Peking Union Medical College, Chinese Academy of Medical Sciences, China

Honorary Professor and chief consultant, Blood Transfusion Institute, Chinese Academy Medical Sciences, China

Honorary Professor, Nankai University

Publications www.medicine.mcgill.ca/changPub.pdf

He has published more than 586 full papers and chapters

More than 500 invited lectures and plenary lectures

30 books and special issues

Other recognitions for his research

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 nominees from McGill's 190 years history

<http://www.medicine.mcgill.ca/artcell/voting%20result.pdf>

Virage Centre of Excellence in high Technology (Permanent), Other awards www.medicine.mcgill.ca/changpub.pdf

He is known as the "Father of Artificial Cells". He proposed and prepared the first artificial cells (Chang 1957 McGill, Science 1964) and continued this research for his research career. **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 area has now progressed well beyond his 1972 predictions. His 2019 review

<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.

Further details: www.medicine.mcgill.ca/artcell free papers, reviews, videos, Monographs and books

COMMENTS BY HIS PEERS

Greatest McGillian in the university's 190 years history A 2011 world wide 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. It 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 has taken off".

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

"..... 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...McGill University, where Chang and his colleagues have been instrumental in advancing the field of blood substitute"

The role of artificial cells in the fight against COVID-19: deliver COVID vaccine, hemoperfusion removes toxic cytokines, nanobiotherapeutics lower free radicals and pCO₂ and replenish blood supply (Chang 2022) (Artificial Cells, Nanomedicine & Biotechnology). 50:1, 240-251, Open access at DOI: [10.1080/21691401.2022.2126491](https://doi.org/10.1080/21691401.2022.2126491)

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.....Several polymeric encapsulation systems have been developed or are currently being tested in clinical trials.... Many are examining the use of biocompatible .. membranes to surround the encapsulated cells"

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 (Others included Kolff, inventor of artificial kidney; Scribner for chronic hemodialysis; Gibbon heart-lung machine; Cooley artificial heart; Kantrowitz intra-aortic balloon pumping; Kolobow oxygenator)

DETAILED C.V. FOLLOWS