

LEROY CHIAO, Ph.D., Astronaut

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Education

Ph.D., M.S. Chemical Engineering, University of California, Santa Barbara, California, 1987, 1985
B.S. Chemical Engineering, University of California, Berkeley, California, 1983

Experience

8/15-pres. Co-founder and CEO of OneOrbit, LLC
9/14-pres. Special Advisor, Houston Association for Space and Science Education
1/14-pres. Co-Founder and President, Black Moon Corporation
1/06-pres. Baylor College of Medicine: Center for Space Medicine Adj Prof; Ast Prof (2012-2017);
Chairman, National Space Biomedical Research Institute User Panel (2006-2017)
12/05-pres. Consultant, Speaker
1/12-5/21 Adjunct Prof., Lecturer (2012-2021), Dept. of Mechanical Engineering, Rice University
2/10-5/20 Member, NASA Advisory Council Human Exploration and Operations Committee
5/17-7/18 Member, National Academies of Sci, Eng. & Med. Planetary Protection Cmte.
1/14-12/17 Executive Coach, TD Enterprises; Leadership Advisor, Phi Kappa Tau 7/14-12/17
1/12-7/17. VP-Aerospace and Medical, Epiphan Video through 6/16; Advisor to the CEO to 7/17
1/12-6/16 Special Advisor for Human Spaceflight, the Space Foundation
7/12-11/13 CEO, Diomics Corporation
7/06-11/12 Advisor and Spokesman, Heinlein Prize Trust
7/06-1/12 Executive VP-Technical Operations, Excalibur Almaz
6/09-9/09 Member, White House Review of U.S. Human Spaceflight Plans Cmte.
8/06-6/08 Raborn Distinguished Chair Professor, Dept. of Mech. Eng., Louisiana State Univ.
7/90-12/05 NASA Astronaut, NASA-Lyndon B. Johnson Space Center, Houston, Texas
1/89-7/90 Research Engineer, Lawrence Livermore National Laboratory, Livermore, California
8/87-1/89 Research Specialist, Hexcel Corporation, Dublin, California
4/87-8/87 Post-doctorate Researcher, Department of Chemical and Nuclear Engineering, UCSB
3/83-6/83 Materials Engineer, Fiber Glas Piping Systems, Inc., San Antonio, Texas

Key Honors and Awards: Leadership Award (Blue Cloud), China Institute
Russian Fed. Medal for the Dev. of Space; Space Tech. Hall of Fame Inductee; Order of Gagarin Medal.
Public Service: Committee of 100; Asian Chamber of Commerce; Asian Pacific American Heritage Assoc.
NASA: Distinguished Service Medal, 4 Space Flight Medals, 2 Exceptional Service Medals, 4 Individual Achievement, 2 Group Achievement Awards, Going the Extra Mile Award
Federation Aeronautique Internationale: Koroliev Diploma, Komarov Diploma, De La Vaulx Medal
Distinguished Alumnus Award, from the University of California, Santa Barbara
Excellence in Achievement Award, from the University of California, Berkeley
Explorers Club: Lowell Thomas Award
Phi Kappa Tau Awards: National Hall of Fame, Borradaile Award, Alumnus of the Year Award
Trustee of the Phi Kappa Tau Scholarship Foundation

Keynote Commencement Speaker for the Depts. of Eng., Univ. of CA, at Berkeley and at Santa Barbara

Special Skills and Licenses: Prof. astronaut (US and Russian Spacecraft): 229 days spaceflight; 36 hours Extra-Vehicular Activity (EVA). Instrument-rated pilot, 3100 hours in various aircraft and spacecraft. Foreign Languages: Russian, Mandarin, elementary German. NAUI Scuba. 2-yrs. training in automotive mechanics.

Research and Publications: Published 17 refereed scientific papers, 3 conference papers, 2 short articles. Numerous seminars. Invited contributor to the Intl. Encyclopedia of Composite Mat., num. policy publications.

Leroy Chiao, Ph.D. – Details of Professional Experience

EXPERIENCE: Leroy Chiao works in business and consulting, is an active international speaker, and participates in various education programs. Dr. Chiao is a co-founder and the CEO of OneOrbit, providing keynotes and training to companies and schools. He also serves as President and co-founder of Black Moon Corporation, a commercial conservation and lunar transportation startup. In addition, Dr. Chiao is an Adjunct Professor in the Center for Space Medicine at Baylor College of Medicine (BCM), and is also a special advisor to the Houston Association for Space and Science Education (HASSE).

In 2012, Dr. Chiao became a Director and the CEO of Diomics Corporation, a bio-materials company. He led the company through technology and product development, business development, testing/validation phases, and corporate governance restructuring. Having brought the company through its startup phase at the end of 2013, Chiao transitioned the chief executive position and served an additional two years as an advisor to the Board of Directors.

From 2017-2018, Dr. Chiao served on the Planetary Protection Committee of the National Academies of Science, Engineering and Medicine. In June 2009, Dr. Chiao was invited to be a member of the White House appointed Review of U.S. Human Spaceflight Plans Committee. The committee reviewed NASA's plans for human space exploration and formulated options for the administration. He served on the NASA Advisory Council's Human Exploration and Ops. cmte, (2009-2020) and is the Special Advisor for Human Spaceflight to the Houston Association for Space and Science Education (HASSE). He also served in a similar role to the Space Foundation from 2012-2016.

Chiao was the first Raborn Distinguished Chair Max Faget Mechanical Engineering Professor at Louisiana State University. He served in that capacity from August 2006 through June 2008, in the Mechanical Engineering Department. He also previously served as the VP and Advisor for Space and Medical for Epiphan Systems (2012-2017) and as the Executive VP of Technical Operations for Excalibur Almaz, a commercial spaceflight company from 2006-2012. In addition, Dr. Chiao held appointments in Rice University's Department of Mechanical Engineering from 2012-2021.

Dr. Chiao served as a NASA astronaut from 1990-2005. He flew four space missions, serving aboard three Space Shuttles and a Russian Soyuz spacecraft. He also served as the commander and NASA science officer of Expedition 10, aboard the International Space Station. During his NASA career, Chiao served in several leadership and management roles, including branch chief.

Dr. Chiao earned a Ph.D. in Chemical Engineering in 1987, from the University of California at Santa Barbara, and joined Hexcel Corporation. There, he was involved in process, manufacturing, and engineering research on advanced aerospace materials. He worked on a joint NASA-JPL/Hexcel project to develop an optically correct, polymer composite precision segment reflector for future space telescopes. He also worked on cure modeling and finite element analysis. In January of 1989 Dr. Chiao joined the Lawrence Livermore National Laboratory (LLNL) in Livermore, California, where he was involved in processing research for fabrication of filament-wound and thick-section aerospace composites. While at LLNL, he developed and demonstrated a mechanistic cure model for graphite fiber/epoxy composite material. An instrument-rated pilot, Dr. Chiao has logged 3000 flight hours in a variety of aircraft and spacecraft.

BOARD MEMBERSHIPS:

NewSpace Journal (Editorial Board, 2013-present)
Diomics Corporations (Director, 2012-2013)
InNexus Corporation (Director, 2006-2011)
Excalibur Almaz Limited (Director, 2006-2011)
Challenger Center (Director, 2008-2010)
Committee of 100 (Director, 2006-2008)

NASA EXPERIENCE: Selected by NASA in January 1990, Dr. Chiao became an Astronaut in July 1991. He received flight assignments as a Space Station Commander, Space Station Science Officer and as a Space Shuttle Mission Specialist. His technical assignments included: Space Shuttle flight software verification in the Shuttle Avionics Integration Laboratory (SAIL); Crew Equipment, Spacelab, Spacehab and Payloads issues for the Astronaut Office Mission Development Branch; Training and Flight Data File issues; EVA issues for the EVA Branch. Dr. Chiao also served as Chief of the Astronaut Office EVA Branch. A veteran of four space flights, he flew as a Mission Specialist on STS-65 (July 8-23, 1994), STS-72 (January 11-20, 1996) and STS-92 (October 11-24, 2000), and was the Commander and NASA Science Officer on Expedition-10 (October 13 to April 24, 2005). Dr. Chiao has logged a total of 229 days, 7 hours, 38 minutes and 5 seconds in space, including 36 hours and 7 minutes of EVA time in six space walks.

SPACE FLIGHT EXPERIENCE: STS-65 *Columbia* (July 8-23, 1994) launched from and returned to land at the Kennedy Space Center, Florida, setting a Federation Aeronautique Internationale flight duration record for P2 spacecraft. The STS-65 mission flew the second International Microgravity Laboratory (IML-2). During the 15-day flight the seven-member crew conducted more than 80 experiments focusing on materials and life sciences research in microgravity. The STS-65 mission was accomplished in 236 orbits of the Earth, traveling 6.1 million miles in 353 hours and 55 minutes. On this mission, Dr. Chiao became the 196th NASA Astronaut to fly in space and the 311th human in space.

STS-72 *Endeavour* (January 11-20, 1996) was a 9-day mission during which the crew retrieved the Space Flyer Unit (launched from Japan 10-months earlier), and deployed and retrieved the OAST-Flyer. Dr. Chiao led two spacewalks designed to demonstrate tools and hardware, and evaluate techniques to be used in the assembly of the International Space Station. In completing this mission, Dr. Chiao logged a total of 214 hours and 41 seconds in space, including 12 hours and 57 minutes EVA time, and traveled 3.7 million miles in 142 orbits of the Earth. During this flight, Dr. Chiao became the first Asian and ethnic Chinese to perform a spacewalk.

STS-92 *Discovery* (October 11-24, 2000) was launched from the Kennedy Space Center, Florida and returned to land at Edwards Air Force Base, California. During the 13-day flight, the seven-member crew attached the Z1 Truss and Pressurized Mating Adapter 3 to the International Space Station (ISS) using Discovery's robotic arm and performed four space walks to configure these elements. This expansion of the ISS opened the door for future assembly missions and prepared the station for its first resident crew. Dr. Chiao was the EVA/Construction Leader for this mission and totaled 13 hours and 16 minutes of EVA time in two space walks. The STS-92 mission was accomplished in 202 orbits, traveling 5.3 million miles in 12 days, 21 hours, 40 minutes and 25 seconds.

Expedition-10 *Soyuz TMA-5/International Space Station* (October 13, 2004 to April 24, 2005). Dr. Chiao was

the Commander and NASA Science Officer of the 10th mission to the International Space Station. Expedition-10 launched from the Baikonur Cosmodrome in Kazakhstan on October 13, 2004 aboard Soyuz TMA-5 and docked with the ISS on October 15, 2004. During his six and a half month stay aboard the station, Dr. Chiao performed numerous tasks including 20 science experiments and two construction and installation spacewalks, using the Russian “Orlan” space suit, totaling 9 hours, 56 minutes of EVA time on this flight. Expedition-10 concluded its successful mission on April 24, 2005 with a safe landing in Kazakhstan. With this mission, Dr. Chiao became the first Asian and ethnic Chinese Mission Commander.

HONORS AND AWARDS: Memberships: Committee of 100 since 2006, Fellow of the Explorers Club since 2005, Association of Space Explorers since 2005. Leadership Award (Blue Cloud), China Institute (2015). Awarded the Order of Gagarin Medal #68/100 approved by the Russian Parliament (2013). Inducted into the Space Technology Hall of Fame (2013). Awarded the Russian Federation Medal for the Development of Space (2012). Recipient of Honorary Ph.D. from Shandong University (2010). Recipient of Pioneer Award from the Organizatin of Chinese Americans (2010). Recipient of the Excellence in Achievement Award from the University of California, Berkeley (2007). Recipient of Asian Chamber of Commerce Public Service Award (2006), the Committee of 100 Public Service Award (2006) and the Asian Pacific American Heritage Association Public Service Award (2005). Recipient of four NASA Space Flight Medals (2005, 2000, 1996, 1994), and numerous other NASA awards, including the NASA Distinguished Service Medal (2005), two NASA Exceptional Service Medals (2000, 1996), four NASA Individual Achievement Awards (2004, 2003, 2002, 2001), two NASA Group Achievement awards (1997, 1995) and the NASA Going the Extra Mile Award (2004). Recipient of numerous Federation Aeronautique Internationale awards, including the Koroliev Diploma (2002), Komarov Diploma (1996) and De La Vaulx Medal (1994). Recipient of the Distinguished Alumni Award, from the University of California, Santa Barbara (1995). Recipient of the Explorers Club Lowell Thomas Award (2008), Inaugurated into the first group of the Phi Kappa Tau Hall of Fame (2006); Recipient of two Phi Kappa Tau awards - the Taylor A. Borradaile National Alumnus of the Year Award (1996) and the Nu Chapter Alumnus of the Year award (1991). Trustee of the Phi Kappa Tau Scholarship Foundation (2006). Recipient of the 2005 Science and Technology Asian Pacific American Heritage Association Award. Recipient of the 2003 Excellence Award in Science and Technology, from the US Pan Asian American Chamber of Commerce. Recipient of the 100 Most Influential Asian Americans in the 1990’s Award from A-Magazine (2000). Keynote Commencement Speaker for the Departments of Engineering at the University of California at Berkeley, and at Santa Barbara (1996). Invited lecturer on honeycomb material and bonded panels, and cure modeling of aerospace composite materials, at the Beijing Institute of Aeronautical Materials, and at the Changsha Institute of Technology, 5th Department, in the Peoples Republic of China (1988). Invited contributor to the International Encyclopedia of Composite Materials (1989).

Publication List – Leroy Chiao, Ph.D.

Selected Policy Publications

- 1. Journey to the Far Side**
Spring 2019 – The Explorers Journal, Vol. 7 No. 1
The Explorers Club
- 2. What China’s Moon Landing Means to U.S.**
January 8, 2019 – CNN.com
<https://www.cnn.com/2019/01/07/opinions/china-moon-landing-outpace-us-opinion-chiao/index.html>
- 3. Soyuz Rocket’s Launch Abort Close Call Highlights Poor Space Policy Decisions**
October 16, 2018 – Space.com
<https://www.space.com/42156-soyuz-abort-close-call-space-policy-leroy-chiao-opinion.html>
- 4. Sputnik Turns 60: Astronaut Leroy Chiao Celebrates 1st Satellite**
October 4, 2017 – Space.com
<https://www.space.com/38356-sputnik-turns-60-astronaut-leroy-chiao.html>
- 5. Astronaut on SpaceX Explosion: We’re Not Quitters**
Septemner 2, 2016 – CNN.com
<https://www.cnn.com/2016/09/02/opinions/space-x-explosion-chiao/>
- 6. What China’s Moon Landing Means to U.S.**
January 8, 2019 – CNN.com
<https://www.cnn.com/2019/01/07/opinions/china-moon-landing-outpace-us-opinion-chiao/index.html>
- 7. Is China Winning the Race for Space Supremacy?**
June 2015 – CNN GPS with Fareed Zakaria
<https://www.cnn.com/videos/tv/2015/06/20/exp-gps-chiao-sot-china-space.cnn>
- 8. Seeking a Human Spaceflight Program Worthy of a Great Nation**
October 22, 2009 – Review of U.S. Human Spaceflight Plans Committee
Commissioned by the White House Office of Science and Technology Policy
http://www.nasa.gov/pdf/396093main_HSF_Cmte_FinalReport.pdf
- 9. U.S. Leadership and Return to the Moon**
July 21, 2014 – U.S. News and World Report
<http://www.usnews.com/debate-club/should-we-go-back-to-the-moon/the-final-frontier-for-american-leadership>
- 10. Is the U.S. Yielding Spaceflight Leadership to China?**
October 15, 2013
<http://www.space.com/23206-is-the-us-passing-the-spaceflight-baton-to-china.html>
- 11. Byzantine NASA: Pioneering Spirit Lost?**
January 25, 2013 – Discovery.com
<HTTP://NEWS.DISCOVERY.COM/CONTRIBUTORS/LEROY-CHIAO/>

12. Time for the U.S. to Partner with China in Space?

November 27, 2012 - Discovery.com

<http://news.discovery.com/space/opinion-nasa-partner-china-politics-spaceflight-gap-121127.html>

13. China's Giant, Quiet Step in Space

June 29, 2012 – CNN.com

http://www.cnn.com/2012/06/29/opinion/chiao-china-space/index.html?hpt=hp_bn7#

14. Traveling by Smoke – Art and Adventure in Papua

Fall 2012 – Explorers Club Journal (V90, No. 3)

15. Farewell, My Space Shuttle

May 16, 2011 – CNN.com

<http://www.cnn.com/2011/OPINION/05/15/chiao.spaceshuttle.farewell/index.html>

16. Space Station Living, Radiation and Monkeys

October 14, 2010 – Discovery.com

<http://news.discovery.com/space/space-exploration-radiation-monkeys.html>

17. The Future for Space

July 20, 2009 – Guardian.co.uk

<http://www.guardian.co.uk/commentisfree/cifamerica/2009/jul/20/apollo-11-moon-landing-space-exploration>

Journal Publications:

1. Chiao, L., Sharipov, S., Sargsyan, A., Melton, S., Hamilton, D., McFarlin, K. & Dulchavsky, S. "Ocular Examination for Trauma: Clinical Ultrasound Aboard the International Space Station" *J. Trauma*, 2005, 58; 5, 885-889.
2. Chiao, L. "Improving Composite Materials through Mechanistic Cure Modeling" *Energy and Technology Review*, March 1990, 1.
3. Chiao, L., "Mechanistic Modeling of Epoxy Resins" 1990, *SAMPE J.*, 26-1, 27.
4. Chiao, L., "Application of Mechanistic Chemical Kinetics to Thermoset Composite Materials" *High Performance Polymers*, 1990, 1-2, 109.
5. Chiao, L., "Mechanistic Reaction Kinetics of 4, 4'-Diaminodiphenyl Sulfone Cured Tetraglycidyl-4, 4'-diaminodiphenylmethane Epoxy Resins" *Macromolecules*, 1990, 23, 1286.
6. Chiao, L. & R.E. Lyon "A Fundamental Approach to Resin Cure Kinetics" *J. Composite Materials*, 1990, 24-7, 739.
7. Roylance, D.A., Chiao, L. & P.M. McElroy "A Versatile Finite Element Code for Polymer and Composite Processing" *Computer Applications in Applied Polymer Sci. II*, ACS Symposium Series 404, T. Provder, Editor, 1989.
8. Chiao, L. & P.W. Borris "Honeycomb Cure Modeling" *SAMPE Quarterly*, 1988, 20-1, 33.
9. Chiao, L., Darfler, S.C. and P.W. Borris "Simulation as a Cure Process Design Tool for Aerospace Materials" *Simulation*, 1989, 53-1, 15.
10. Chiao, L. & R.G. Rinker "The Simulated Behavior of an Autothermal Reactor Under Relaxed-Steady State Operation" *Ch.E. Comm.*, 1988, 73, 163.
11. Chiao, L. & R.G. Rinker "A Kinetic Study of Ammonia Synthesis: Modelling High-Pressure Steady-State Operation" *Ch.E. Sci.*, 1988, 44-1, 9.
12. Chiao, L. & R.G. Rinker "On the Use of Approximations in the Modelling of Plug-Flow Reactors under Periodic Operation" *Ch.E. Comm.*, 1987, 57, 153.
13. Chiao, L., Zack, F.K., Thullie, J. & R.G. Rinker "Concentration Forcing in Ammonia Synthesis: Plug-Flow Experiments at High Temperature and Pressure" *Ch.E. Comm.*, 1987, 49, 163.
14. Thullie, J., Chiao, L. & R.G. Rinker "Analysis of Concentration Forcing in Heterogeneous Catalysis" *Ch.E. Comm.*, 1987, 48, 191.
15. Thullie, J., Chiao, L. & R.G. Rinker "Analysis of Concentration Forcing in Heterogeneous Catalysis" *Ch.E. Sci.*, 1987, 42, 1095.

16. Thullie, J., Chiao, L. & R.G. Rinker "Production Rate Improvement in Plug-Flow Reactors with Concentration Forcing" *I. & E.C. Research*, 1987, 26, 945.
17. Thullie, J., Chiao, L. & R.G. Rinker "Forced Concentration Oscillations in Catalytic Tubular Reactors" *Inz. Chem. I. Proc.* 1986, 4, 545.

Conference Papers:

1. Chiao, L. & T.T. Chiao "Challenges in Processing for Polymer Composites" *Presented at the 36th Sagamore Conference on Thick Section Composites, Plymouth, Massachusetts* (published proceedings), October 23-26, 1989.
2. Chiao, L. "Mechanistic Modeling of Epoxy Cure" 1. Poster paper at the *Gordon Research Conference on Thermosetting Polymers, New London, New Hampshire*, July 3-7, 1989. 2. Presented at the *American Institute of Chemical Engineers Second Topical Conference on Emerging Technologies in Materials*, San Francisco, California (Abstract published in proceedings), November 6-10, 1989.
3. Chiao, L. and P.W. Borris "On the Use of Cure Modeling in Honeycomb Processing" *Proceedings of the 34th SAMPE Symposium*, Reno, Nevada, May 8-11, 1989.

Books and Contributions:

1. Chiao L. (2020) *hy Return Humans to the Moon?*. In: Young L.R., Sutton J.P. (eds) *Handbook of Bioastronautics*. Springer, Cham. https://doi.org/10.1007/978-3-319-10152-1_72-1
2. Chiao, L. "OneOrbit" Galerie Zdenek Sklenar 2016. ISBN 9788087430699
3. Chiao, L. "Ah, Open Space" Book chapter for *They Lived to Tell the Tale*, Jan Jarboe Russell, Editor, The Lyons press, 2006. ISBN 1592289916
4. Chiao, L. "Process Modeling, Cure" Book chapter for the *International Encyclopedia of Composites*, Stuart M. Lee, Editor, VCH Publishers, 1989. Also published in the *Concise Edition*, 1992.

Short Articles:

1. Chiao, L. "In-Situ Ceramics Processing for Lunar Base" *SAMPE J.*, 1992, 28-2, 108.
2. Chiao, L. "Armor Concepts-Adaptation from the Gulf Into Space" *SAMPE J.*, 1992, 28-5, 7.

Selected Invited Technical Seminars:

1. Considerations for Long Duration Space Flight

May 22, 2007 – *Tsinghua University*
Beijing, China

2. Operations and Hardware Overview of the Soyuz Spacecraft and the International Space Station

September 8, 2006 – *Astronaut Research and Training Center of China*
Beijing, China

February 14, 2006 – *Nanjing Institute of Aeronautics and Astronautics*
Nanjing, China

3. EVA: EMU, Orlan and Future

June 2, 2006 – *International Symposium on Next-Generation Spacesuits*
Tokyo, Japan

4. Using Indigenous Materials for Future Lunar and Mars Missions

June 13, 1991 – *Lawrence Livermore National Laboratory*
Livermore, California

5. Mechanistic Modeling of Cure

June 12, 1991 – *Lawrence Livermore National Laboratory*
Livermore, California

6. Composite Materials and the Chemical Engineer

December 5, 1988 – *University of California, Dept. of Chemical and Nuclear Eng.*
Santa Barbara, California

7. Honeycomb Basics and Materials Cure Modeling

October 25, 1988 - *Lawrence Livermore National Laboratory*
Livermore, California

8. Application of Cure Modeling to Aerospace Materials

October 13, 1988 – *Beijing Institute of Aeronautical Materials*
Beijing, China

October 18, 1988 – *Changsha Institute of Technology, 5th Department*
Changsha, China

9. Basics of Honeycomb and Bonded Panels

October 13, 1988 – *Beijing Institute of Aeronautical Materials*
Beijing, China

October 18, 1988 – *Changsha Institute of Technology, 5th Department*
Changsha, China

Selected Invited Panel Discussions:

1. Lost in Space: The Need for a Definitive U.S. Space Policy

October 2016 and January 2013 – *The Baker Institute at Rice University*
Houston, Texas

2. Future of Human Space Flight and Space Tourism

June 3, 2008 – *26th International Symposium on Space Technology and Science*
Hamamatsu, Japan

June 6, 2006 – *25th International Symposium on Space Technology and Science*
Kanazawa, Japan

3. Qualifications of a Moon Astronaut

May 21, 2007 – *16th International Aerospace Association Human in Space Conference*
Beijing, China

4. Operational Requirements for Long Duration Moon Missions

May 4, 2007 – *International Space Medicine Summit, The Baker Institute at Rice University*
Houston, Texas

5. Future of Human Space Flight Activities

April 24, 2006 – *Milken Institute Global Conference*
Santa Monica, California

Selected Organized Conferences

1. International Space Medicine Summit

May 2008-2020 – *Conference Organizing Committee (annual)*
Baker Institute, Rice University, Houston, Texas

2. Risk and Exploration, Earth as a Classroom

October 28-30, 2007 – *Conference Co-Chair*
Louisiana State University, Baton Rouge, Louisiana