COVER ILLUSTRATION

There is a wealth of variation and diversity in planets outside of our Solar system, as illustrated in this artistic representation, offering an exciting opportunity to understand their stellar interactions, formation, interior processes, and atmosphere in terms of habitability and the future of holistic characterization. Credit: NASA/JPL-Caltech

Original link: https://exoplanets.nasa.gov/resources/2319/exoplanet-types-illustration/

Reviews in Mineralogy and Geochemistry, Volume 90

Exoplanets: Compositions, Mineralogy, Evolution

ISSN 1529-6466 (print)
ISSN 1943-2666 (online)
ISBN 978-1-946850-12-6

The MINERALOGICAL SOCIETY of AMERICA
3635 Concorde Parkway, Suite 500
Chantilly, Virginia, 20151-1125, U.S.A.
www.minsocam.org

Exoplanets:
Compositions, Mineralogy, Evolution

90 *Reviews in Mineralogy and Geochemistry* **90**

DEDICATION

An Yin, of UCLA, was invited to write a chapter on planetary tectonics. Dr. Yin unfortunately passed away during a field trip to the eastern Sierra Nevada just months before chapters were due—a devastating loss for the scientific community and an immeasurable loss to our RiMG workshop and volume. An was invited to contribute to our volume because his approach to understanding tectonic processes was informed by decades of near peerless field studies of some of Earth's most perplexing structures, including the growth of the Tibetan Plateau, and before that, the nature of low-angle normal faults of the Basin and Range province (see Chapter 9 for references). These field studies were matched by a remarkably complete understanding of experimental and theoretical rock mechanics. These field and theoretical faculties combined in An to yield a view of tectonics unique from contributors who are rooted more heavily in the theory of convection, heat flow and deep mantle processes, with or without the nuances of computer simulations. This is not at all to say that the latter are of lesser value—they assuredly are not. But our hope was, if ever so slightly, to rebalance the scale with regard to the kinds of observations that are utilized to speculate on a planet's tectonic behavior. An's group has developed some fascinating insights and their work at Enceladus provides an enlightened example for testing our sundry models of tectonic processes. An's colleague, Mark Harrison, has an excellent discussion of An's work, which can be found here: https://epss.ucla.edu/news/in-memoriam-professor-an-yin/. For a sampling of what we have lost, An's outline follows:

1. Introduction: fundamental concepts and methods in tectonic studies; significance of planetary tectonic studies for understanding the solar-system evolution (resurfacing and recycling of thermal boundary layers). Importance of Earth-based research when placed in a sound physical contexts (e.g., Lithosphere/thermal boundary layer; tectonics; plate tectonics; plate-boundary processes; discrete vs. distributed deformation; oceanic vs. continental deformation).

2. Tectonics of rocky planets and rocky moons
a. Earth (early history, primitive plate tectonics, modern plate tectonics)
b. Mercury
c. Venus
d. Mars
e. Earth's moon
f. Jupiter's moon Io

3. Tectonics of icy satellites and dwarf planets
a. Europa
b. Enceladus
c. Titan
d. Miranda
e. Charon
f. Pluto

4. Discussion
a. Kinematic classification of tectonic deformation in the Solar System
b. Dynamic regimes of tectonic deformation in the Solar System
c. Scaling rheology, geometry, and gravity.

It is no understatement that An's passing is a devastating loss—a setback in planetary tectonics that may be impossible to quantify but is undoubtedly immense. Nevertheless, while there is no easy replacement for An's combination of field and theoretical knowledge, this loss may inspire others to take up the challenge of integrating field and theory, and using observations of our planetary neighbors to validate numerical and theoretical models. There could be no better tribute to An's memory than for a reader of this volume to take on this immense but invaluable task.

Keith D. Putirka (California State University, Fresno, CA)