Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.10660

How to build a legacy of scientific leadership: the HR formula

PROF. JULIA HAMMER, PHD[1], LESLIE BAKER[2], JENNI BARCLAY[3], MICHAEL R. CARROLL[4], MICHELLE COOMBS[5], ELIZABETH COTTRELL[6], NICHOLAS J DYGERT[7], LINDA ELKINS-TANTON[8], EMILY FIRST[9], JAMES GARDNER[10], DAVID GOLDSBY[11], JAMES GREENWOOD[12], MARIE JOHNSON[13], MIKE KRAWCZYNSKI[14], CHARLES MANDEVILLE[15], MOLLY MCCANTA[16], MICHELLE E. MINITTI[17], WILLIAM NELSON[18], TABB PRISSEL[19], DINA VENEZKY[20], CATHERINE WEITZ[21] AND DIANE WOODRUFF[22]

[1]University of Hawai‘i
[2]University of Idaho
[3]University of East Anglia
[4]Camerino University
[5]U.S. Geological Survey
[6]National Museum of Natural History, Smithsonian Institution
[7]University of Tennessee, Knoxville
[8]Arizona State University
[9]Cornell University
[10]University of Texas at Austin
[11]University of Pennsylvania
[12]Wesleyan University
[13]Cal State Fullerton
[14]Washington University in St. Louis
[15]US Geological Survey
[16]University of Tennessee at Knoxville
[17]Framework, Silver Spring
[18]University of Hawaii at Manoa
[19]NASA
[20]Smith College
[21]Planetary Science Institute
[22]Anadarko Petroleum Company

Presenting Author: jhammer@hawaii.edu

Throughout their 50-year scientific partnership at Brown University, Paul Hess and Malcolm Rutherford shaped the frontier of planetary petrology and mentored dozens of undergraduates, graduate students, postdocs and junior faculty. Their contributions in the scientific and mentoring domains are exemplified by transformative studies rooted in experimental petrology.

• Working with exceptionally valuable extraterrestrial materials, Rutherford determined the compositions of liquids in equilibrium with the mineral assemblage by performing phase equilibrium experiments and homogenizing melt inclusions in a Martian meteorite, finding fundamental distinctions between SNC and terrestrial basalts.

• Integrating geodynamic modeling with physical chemistry, Hess, in a variety of collaborations, explored the consequences of magma ocean fractional crystallization and cumulate overturn of planetary mantles, yielding insights on the petrogenesis of lunar mare basalts, the lunar Mg-suite, and the earliest Martian crust.

• Separately and together, they pursued interests in silicate liquid immiscibility. Hess considered structural roles of elements in the context of compositionally simple systems, guided by phase equilibria and enthalpy calculations whereas Rutherford performed experiments to determine the intensive parameters leading to development of Si-rich liquids from plausible parental liquids in the lunar interior.

• Rutherford's internally heated pressure vessel (IHPV) has been the most consistently productive in the USA, from 1980-2022. Sequences of studies exploiting the unique features of Rutherford's IHPV apparatus explored the behavior of C-O-H-S volatiles in basaltic magmas, helping to resolve their abundances and speciation in the lunar interior.

The duo established an impressive scientific lineage that populates academic departments, industrial labs, NASA, the Smithsonian Institution, National Labs, and the USGS. Rutherford and Hess guided dozens of early-career investigators through evolving socio-professional contexts. How did they achieve this? They model admirable personal qualities including enthusiasm and selflessness; they tailor career guidance to each mentee; they are generous with their time; they bolster mentees' confidence; and they advocate personal/professional balance. The positive outcomes of mentoring for early-career scientists are obvious, as are the positive outcomes of good mentoring for scientific advance. The HR partnership demonstrates the strategic benefits of investing time in peer-mentor relationships and forging a supportive community that begins at the lab bench.