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Presentation of the 2010 Roebling Medal of the Mineralogical Society of America to Robert C. Newton

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It is a distinct honor to introduce the 2010 Roebling Medalist, Robert C. Newton. I first met Bob in 1982, in California, on a blueschist and eclogite field trip for which I had been drafted as an anonymous student driver. It was my first year in graduate school, and I was just becoming aware of his work. But as I read and learned in the following years, I realized that this unfailingly polite and considerate personality had contributed to every subject in which I was interested. So imagine my surprise when, some 15 years later, I received an enthusiastic letter from him expressing interest in what we were up to at UCLA, and in moving west upon his retirement to form a collaboration. I replied with alacrity, to the effect that this was about the best idea I'd ever heard. The rest is history: we've now worked together as colleagues and friends for about a dozen years. So I am essentially reporting from the front lines when I say that this year's Medalist is eminently deserving of MSA's highest award.

That Bob now hangs his hat at UCLA represents something of a homecoming, for it is here that he began making his earliest contributions to the experimental characterization of the mineral equilibria that lie at the heart of understanding how the Earth's crust and mantle operate. He did his Ph.D. work at UCLA in George Kennedy's lab, on calc-silicate phase equilibria. He then headed to the University of Chicago, where he and Julian Goldsmith would pursue a breathtaking array of experimental studies. Some of Bob's earliest Chicago work targeted the aluminosilicate polymorphs. In the early 1960s, it was known that their occurrence offered clues to depths and temperatures of metamorphism. But these refractory phases proved difficult to study experimentally. Poor equilibration in experimental investigations led to widely discrepant versions of the "triple point" at which kyanite, andalusite, and sillimanite coexist. In 1966, Bob produced two classic papers, which provided the first correct equilibrium phase relations in the system. The work has been modified only slightly since.

Bob's achievement depended in no small measure on his recognition that experimental equilibrium can only be ensured by "reversals," in which both forward and reverse progress of a reaction are documented. Although first used by such notables as Tuttle and Bowen in 1958, and Greenwood in 1959, the reversal did not immediately become the criterion for demonstrating equilibrium that we now understand it to be. Bob was arguably the first experimentalist to recognize its importance and consistently apply the technique. This was especially important for studies of metamorphic phase equilibria in which temperatures may be relatively low, and it essentially opened the field of experimental petrology for the study of metamorphic phase equilibria.

Early on, Bob recognized that phase-equilibrium experiments were profitably complemented by direct measurement of thermodynamic properties of minerals and mineral assemblages. By 1970, he had begun work with Ole Kleppa on calorimetric measurements of complex silicates. This led to precise constraints on enthalpies of formation of many common rock-forming minerals; in fact, it is hard to find a mineral or solid-solution series that was not dropped into the calorimeters during this productive collaboration.

In the early 1980s, Bob began working on deep-crustal rocks exposed in southern India. He realized that some of these "granulites" posed a fundamental problem: key outcrops preserve evidence for granulite formation instigated by passage of a fluid, but the metamorphic pressure and temperature were in excess of water-saturated melting. Bob and coworkers proposed that these observations could be reconciled if the fluid were rich in CO_2. This suggestion set off a veritable "gold rush," as granulite researchers hurried to uncover the role of fluids in creating granulites worldwide. But problems soon arose—though CO_2-rich fluid inclusions were common, fluids with sufficient CO_2 to prevent melting should precipitate graphite, which is not common. Many were inclined to abandon a role for fluids. Bob took a different approach: he believed in the field evidence and searched for alternatives. This led him to realize that a better natural mechanism for reducing H_2O activity in the lower crust was by dissolved alkali halide salts.

Fueled by the idea that salty fluids were the key to the formation of some granulites, Bob set out in a new research direction. He worked with Leonya Aranovich to characterize the fundamental thermodynamic properties of NaCl-KCl brines at high *P* and *T*. He became interested in the ability of these fluids to dissolve and transport matter, which is what brought him to UCLA, where he and I have collaborated on this shared interest over the last decade. During this period Bob has produced yet another set of fundamental experimental studies, this time illuminating the workings of brines in the deep crust.

It has been a long journey, which is appropriate, since our Medalist is known—at least to some of you—for his love of long walks. Even more fitting is that we celebrate his accomplishments in Denver, for it is from here that Bob ventured out on his first extended foray by foot. Perhaps the GSA meeting he was attending had taken its toll, but he looked at the mountains from his hotel window and decided that he needed to get up there. He walked out the door, headed due west and, undeterred

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by freeway crossings and "helpful" policemen, got to the top and back in a single day. I think we have succeeded in convincing him that walking to UCLA from his home in Whittier is not in his job description, but I believe his love of walking serves as a window into his continued success: dedication, fortitude, and the remarkable ability to give himself over to an idea. Add a singular intelligence and unfailing rigor, and you have the recipe for a highly successful career as a scientist and a truly outstanding human being.

President Brady, MSA Officers, and members of the Society and guests, it is a privilege to present to you the 2010 Roebling Medalist, Robert C. Newton.