

Felsic magma diversity, & triumphs and perils of granite typology

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Tuttle & Bowen (1958; T&B) demonstrated coincidence of minimum melt with dominant compositions of both silicic volcanic (~rhyolite) and plutonic (~granite) rocks. This implied a common origin for *magmatic* rhyolites and *controversial* granites, partly solving the “granite problem.” But were all granites and all rhyolites formed in the same way? Or were distinct processes and sources involved, masked by convergence toward qtz-feldsp-melt equilibrium? Are felsic magmas generated by crustal anatexis, by fractional crystallization of mantle magma, or both?

Chappell & White (1974; C&W), using a combination of classical and new techniques, demonstrated that Lachlan Fold Belt granites were generated from distinguishable sources. Petrographic and geochemical characteristics indicated contributions from both metasedimentary (S-type) and igneous (I-type) sources. Thus was born granite “typology,” and an appreciation for recognizable diversity in felsic magmas (at least those from which granites form).

Initially inspired by C&W, an ever-expanding host of studies has demonstrated diversity of felsic magmas/rocks in terms of source materials; involvement of juvenile magma; tectonic setting; volume and time scales; extraction, ascent, storage, emplacement +/- eruption; T/H₂O; and fluctuating conditions. In response to this diversity, granite typologies – elemental discrimination, tectonic, association-based, as well as expanded alphabetic – have blossomed.

We view typology today as reflecting both progress toward and obstacles to understanding of felsic magmatism: **Progress:** appreciation for *magmatic diversity*; *correlation of significant characteristics*; potential for *insights into tectonic and petrogenetic processes*. **Obstacles:** (1) *Misplaced faith* in typology as *interpretation*; (2) *Simplistic application* of often abbreviated criteria; (3) *Failure to specify criteria* for “types;” (4) *Confusing array* of partially overlapping typologies; (5) *Absence of or minimal attention* to volcanism (cf. significance in T&B)

Felsic magmatists should (1) Be aware of insights from typology, but specify criteria and **DON’T** prioritize simply “typing” in lieu of critical interpretation; (2) Apply lessons from volcanics to granites (and vice versa); (3) Recognize that “types” are pigeonholes within continua and that felsic magmas have multiple components and diverse histories.

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