### S-I-A-M Classification

- Chappell and White
- S-type granites
- I-type granites
- A-type granitoids
- M-type granitoids

### S-Type Granites

- Occur in regional metamorphic terranes
- Partial melting of metasediments
- High Al but contain no hornblende
- Biotite, muscovite, cordierite, & garnet
- High Rb in source rocks
- Initial Sr ratios > 0.710

![S-type granitoids diagram](image.png)

### I-Type Granites

- Subduction zone continental margin
- High Ca and Na
- Contain hornblende and sphene
- Hornblende-rich inclusions
- Melting of deep crustal igneous rocks
- Source region poor in Rb
- Initial Sr isotope ratios < 0.708

![I-type granites diagram](image.png)

### A-Type Granitoids

- Anorogenic origin
- High in SiO₂, up to 77%
- High alkalies, Fe/Mg, halogens
- Peralkaline?
- Stable craton environment

![A-type granitoids diagram](image.png)
M-Type Granitoids

- Originate as fractionated mantle melts
- Underplated mantle melts
  - May assimilate crustal materials
  - May mix with crustal melts
- Low Rb, Th, U
- Initial Sr ratios <0.705
- Forms tonalites

Time and Depth of Emplacement

- Post-tectonic
  - Cross cutting contacts
- Syntectonic
  - Concordant fabrics
- Pretectonic
  - Metamorphic imprint on fabric