

Comparisons: FeSC with cuprates, etc.



Strong vs. weak coupling?

Single vs. multibands?

2D vs. 3D?

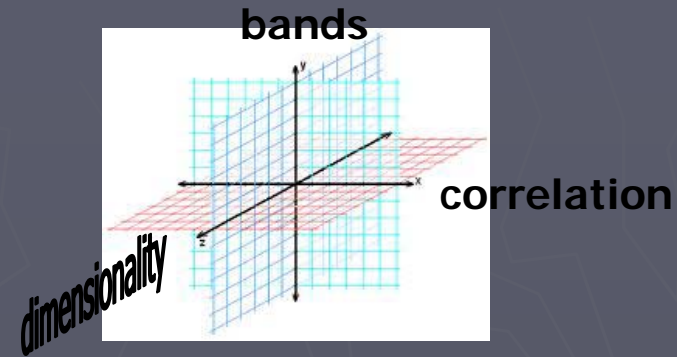


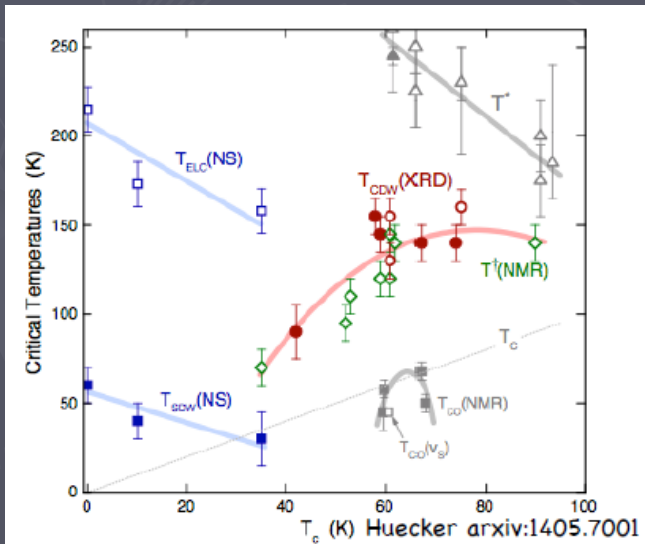
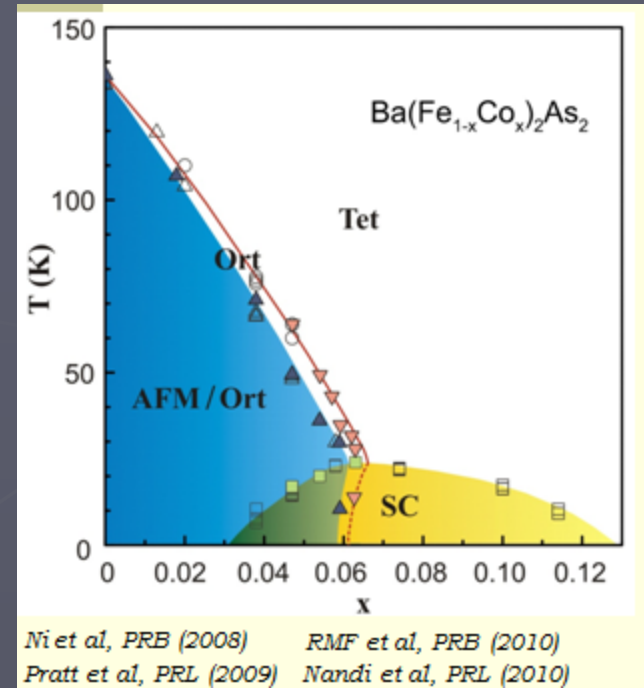
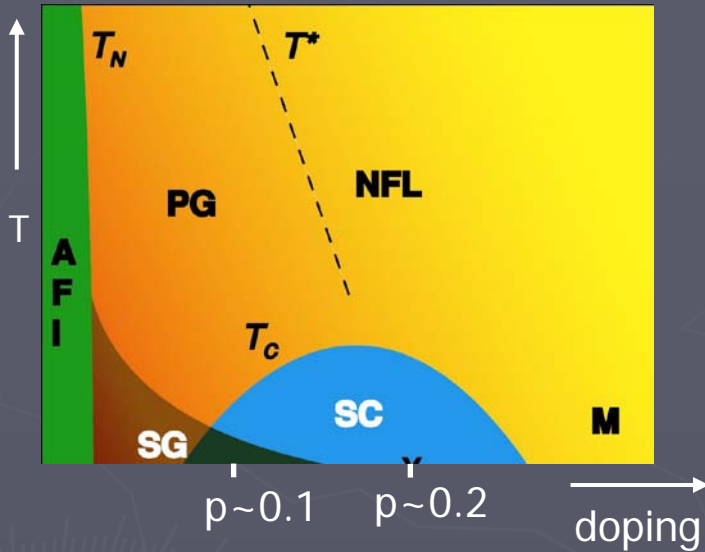
Table 1 | Properties of different classes of superconductor

| Property | Conventional superconductors | Copper oxides | MgB ₂ | Iron-based superconductors |
|---------------------------|------------------------------|------------------------------------------|------------------------------|----------------------------------------------|
| T_c (maximum) | <30 K | 134 K | 39 K | 56 K |
| Correlation effects | None (nearly-free electrons) | Strong local electronic interaction | None (nearly-free electrons) | Long-range (non-local) magnetic correlations |
| Relationship to magnetism | No magnetism | Parent compounds are magnetic insulators | No magnetism | Parent compounds are magnetic metals |
| Order parameter | One band, same-sign s wave | One band, sign-changing d wave | Two band, same-sign s wave | Two band, presumably sign-changing s wave |
| Pairing interaction | Electron-phonon | Probably magnetic (no consensus) | Electron-phonon | Presumably magnetic |
| Dimensionality | Three dimensional | Two dimensional | Three dimensional | Variable |

I. Mazin, Nature 2010

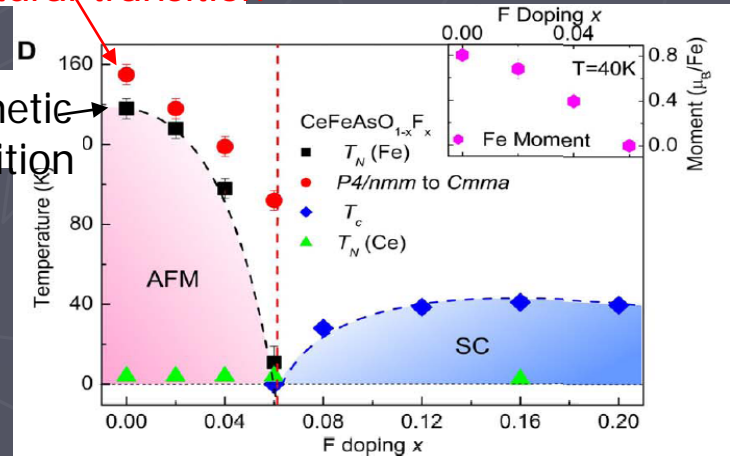
Phase diagrams

Cuprates



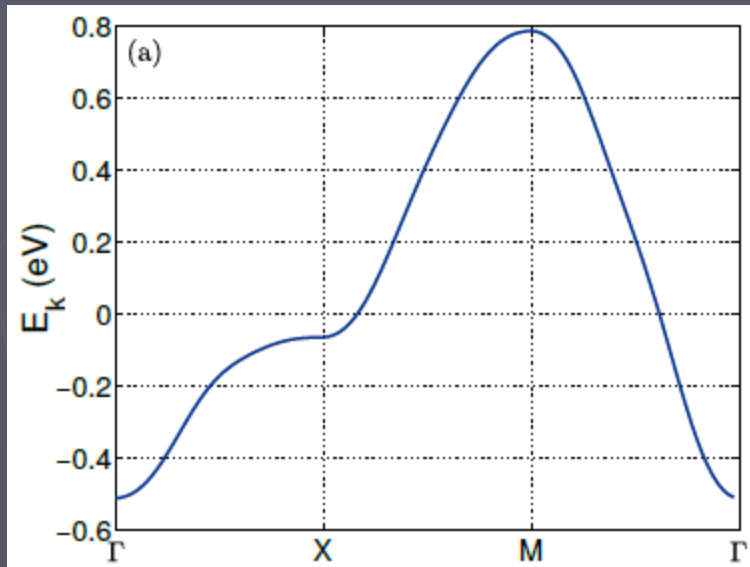
structural transition

magnetic transition



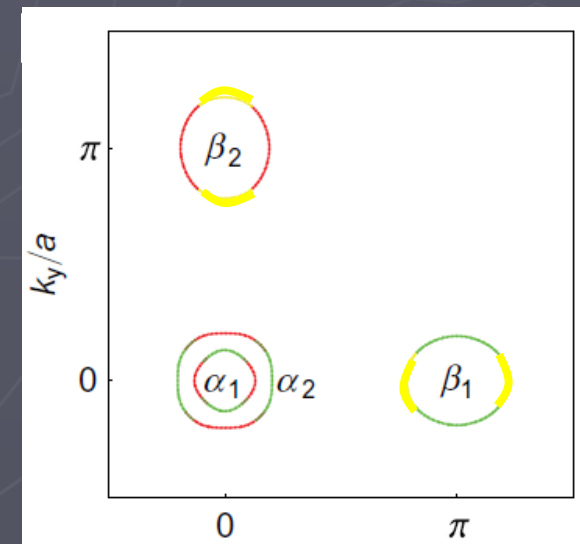
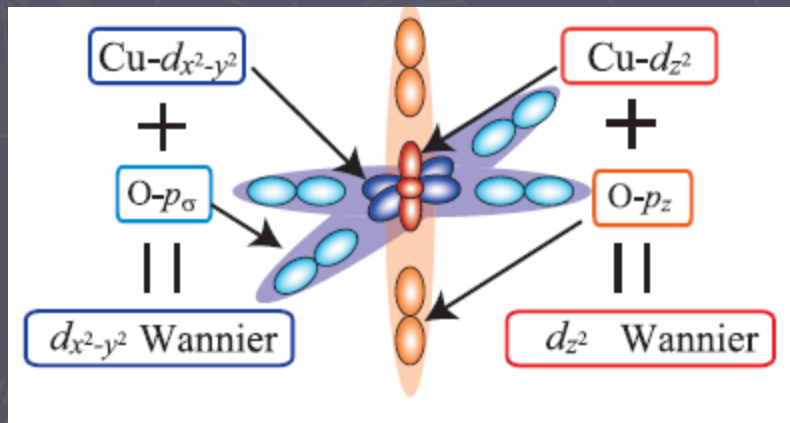
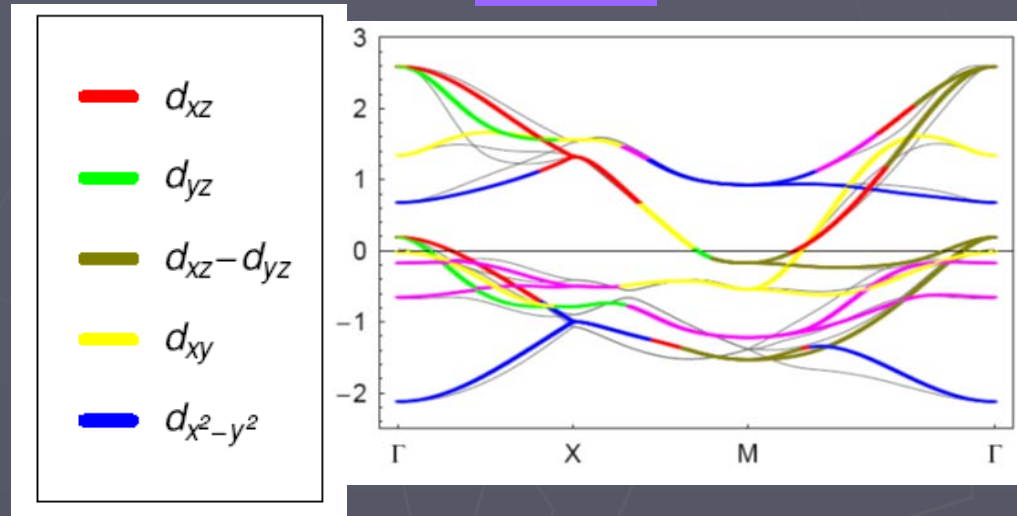
“Single” vs. multiorbital physics

Cuprates

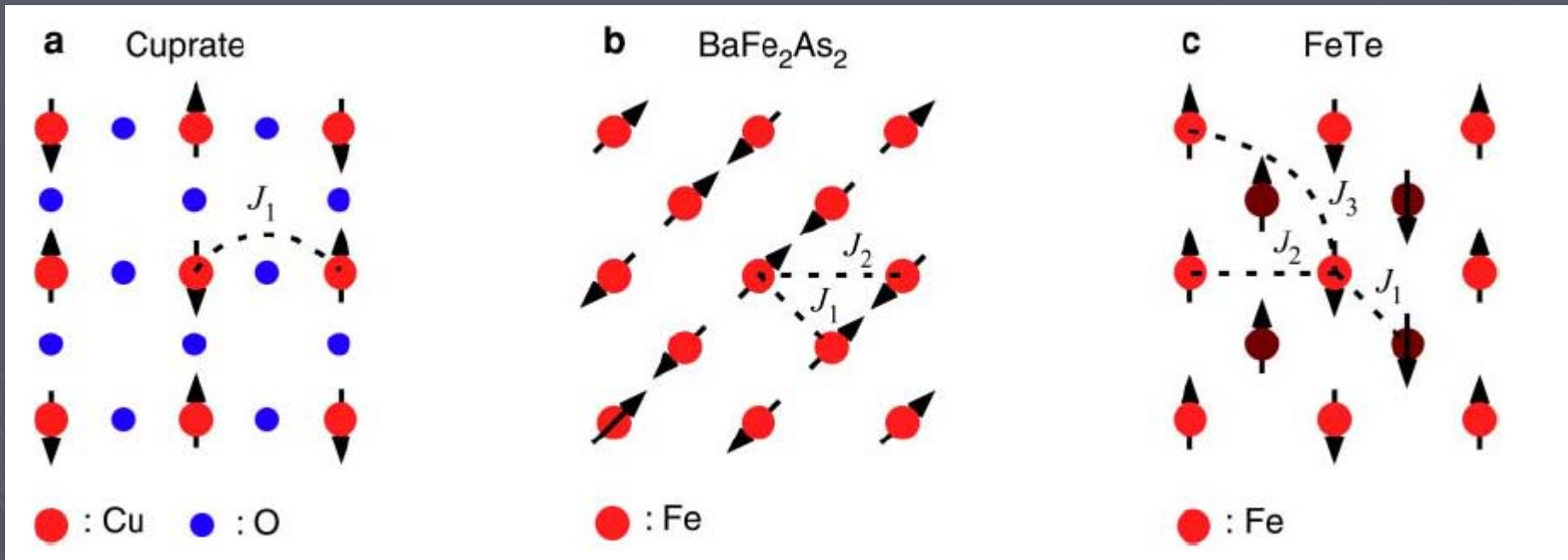


FeSC

LaOFeAs



Magnetism



Essentially all cuprates
Have AF parent compound
With 1 type magnetic order

Also: C4 symmetric magnetic phases

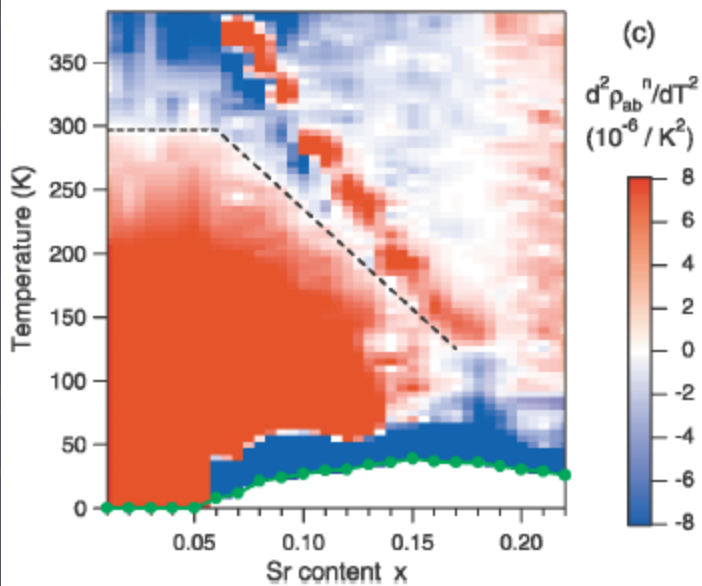
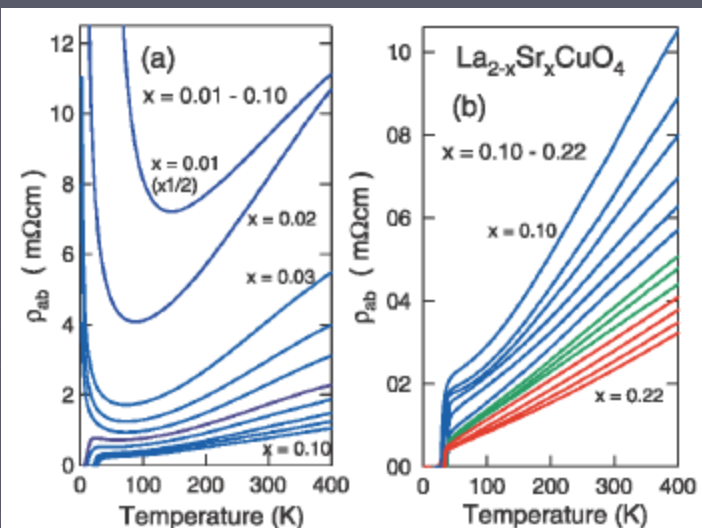
Hints of nearby ferromagnetism in LiFeAs

Strong magnetoelastic coupling

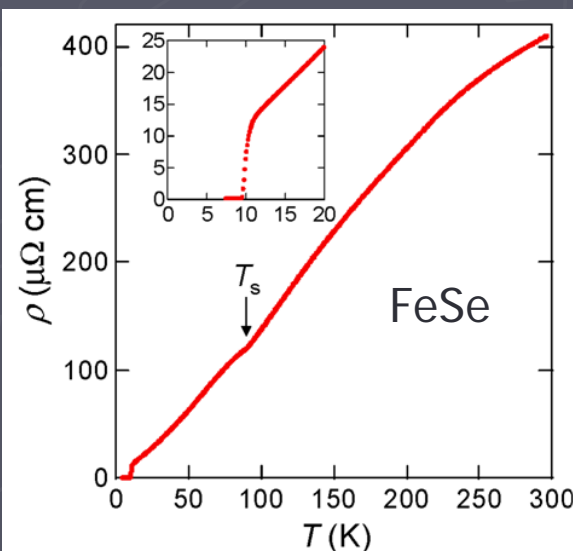
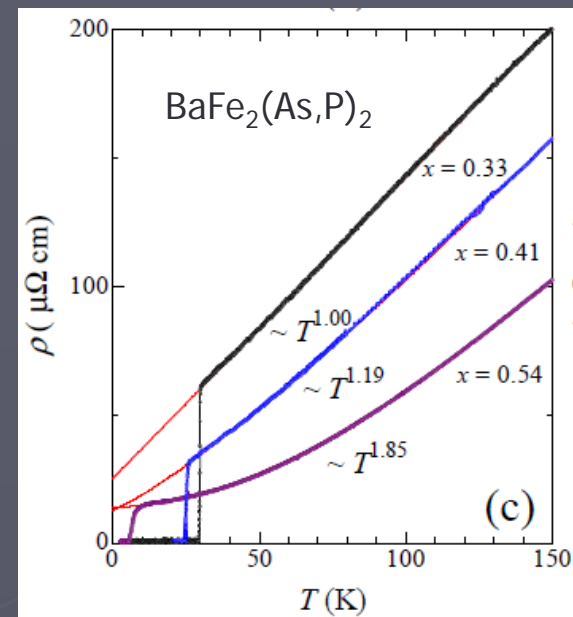
Magnetic moment "soft"

Transport

Cuprates



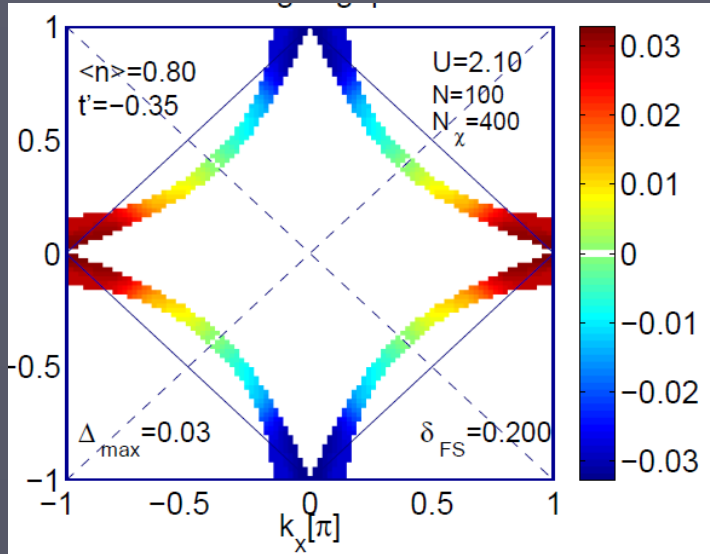
FeSC



S. Kasahara *et al.* 2014

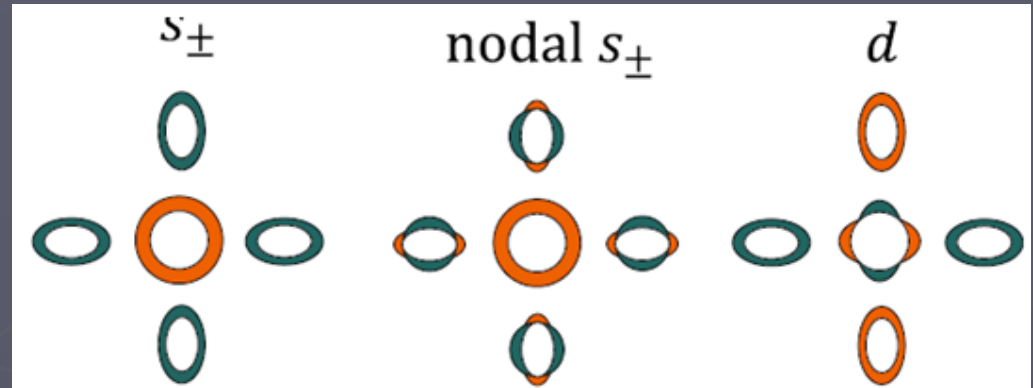
Superconductivity

Cuprates



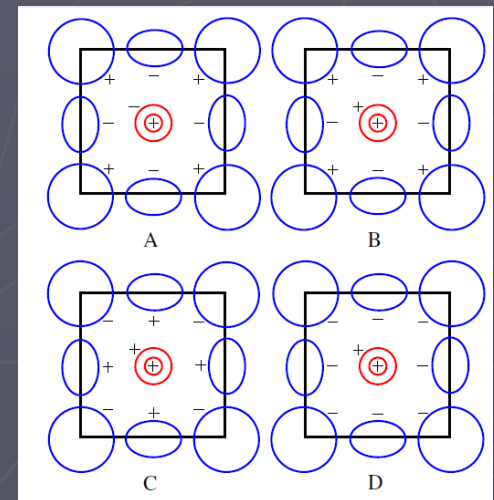
Gap structure robust

FeSC



Gap structure sensitive to perturbations

Ahn et al 2014



Different symmetry superconducting order may be driven by *morphology of Fermi surface*
 --- need not imply a different pairing mechanism

See Chubukov & Basov "Manifesto for higher T_c ", Nat. Phys '11 Scalapino, "A Common Thread" RMP '12