

# CRBTSM2 - what did we learn?



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# Galactic or Extra-Galactic?

- 🌐 All Galactic? (Dave Eichler)
- 🌐 All extra-Galactic? (Andy Strong)
- 🌐 I'm confused (Roger Blandford)!
- 🌐 But surely not all Solar (E. Teller).

# Positrons

- All standard secondary production (Eli Waxman, Paolo Lipari)?
- Pulsar origin (Yves Gallant, Benoit Cerutti)?
- In sources (Blasi et al)?
- Dark matter - not seriously discussed!

# Transport

- Need much more physical transport models!
- Galprop is a reference model, but no more.
- Winds, non-linear wave production, improved model of ISM - fountains, overturning, chimneys - dynamical and not static.
- Stochasticity and local sources.....

# Composition and spectra

- Time to drop references to knee and ankle?
- How many components? Five (Serap Tilev)?
- Looks like dominant first Galactic component has a maximum rigidity at the low value of  $100\text{TeV}$  - then consistent with gamma-ray observations of SNRs?
- Second GCR from GC, LLGRBs or other source?
- GZK or acceleration limit plus photo-dissociation?

# GRBs and UHE CRs and Neutrinos

- Surprisingly high Icecube flux is very interesting - is the Waxman Bacall “bound” anything more than a co-incidence?
- GRBs not looking very promising as sources of UHECRs - but not ruled out either.
- And radio galaxies also have problems!

# Anisotropies

- Something we have learnt - how to interpret the Milagro/HAWC/Icecube/Argo data.
- TA hot-spot - suggestive but problematic.
- Does a heavy nucleus anisotropy really imply a stronger proton anisotropy at lower energy (modulo metallicity)?

# Acceleration theory

- Dominated now by big simulations.
- Nice to see many of our old ideas confirmed!
- But new twists - non-steady shocks etc.
- Do extreme non-linear effects occur?
- How to handle magnetic reconnection?
- The Crab - an enigma still!

# What did we not learn?

-  This slide deliberately left blank!

# What did we learn?

- Plenty of life in the field yet!
- Some progress has been made.
- Definitely moving to higher quality data requiring much more physical models.
- Still mysteries to be solved.
- Interactions in small workshops like this very useful and stimulating.