What is the role of blind analyses in precision cosmology?

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What is not a blind analysis?

Doing two analyses in parallel: double unblind.
“Mock data” analysis.
Use fraction of the data; freeze analysis. (Semi-blind)

What is a blind analysis?

1. ‘Encrypt’ the science result: e.g., add a non-changing random number to a numerical result or transform a variable (such as the distant scale).
Do NOT blind how the result changes in response to changes in the analysis.
Do NOT blind calibration data, etc.
2. ‘Hide’ the signal region. [Needs a more mature field?]
*** Analysts can define checks you will do after unblinding. They can affect what you report (in addition to the blinded result). Example: Cryogenic Dark Matter Search.

Why blind the science results?

Avoid unconscious experimenters’ bias about the ‘right answer’, the desired result or significance, etc.
Data are precious; do everything one can to ensure integrity of results.
Just thinking about how one would blind one’s analysis helps develop a more thorough understanding of the analysis and its pitfalls.

Why not do a blind analysis?

Too difficult to come up with blinding technique that does not compromise crosschecks?
Field not mature enough?
Detectors not well enough understood?
But do you really need to know w(z) to calibrate your detectors?

Differences between cosmology and particle physics:

Heavenly lab versus terrestrial lab. Don’t know the initial state in cosmology.
Detectors better understood in particle physics – but not so true in the future with instruments optimized for precision cosmology.
Data are made public in astrophysics.
   Checks can be made that way.
Can’t blind public data.
“Didn’t matter in past because nothing really mattered in astrophysics?”

**When to use it?**

Precision measurements of cosmological parameters?
Small effects: e.g., cosmic shear.
BAO? Arbitrary scale factor in k space?
SN? (Some blinding done already.)

**Participant summary:**

“Blinding is extremely important but one of many tools in the toolbox.”

“For supernova analyses, it’s trivial; other cases not obvious how to do it without messing up the cross-checks.”

“Blind analysis can be very helpful. Can be supplemented by other techniques. Produce results that people can trust.”

“Makes for really boring papers but it’s the way forward.”*Really?

“Technique can be useful but make data public, so that anyone can analyze it; look for convergence of results.”**But that can be a symptom of unconscious bias…

“We have the advantage in cosmology that we are trying to get one set of numbers using many different techniques => provide our own cross-checks. Not clear how to do it with structure formation probes.”**

“Yes, do it, but allow freedom to do cross-checks after unblinding.” ***Yes (see above).

“Convinced that it’s the right way to go, now that I understand you don’t have to be rigid.”

“Very interesting; should be done in cosmology. Wild west should be tamed.”