Q1 What do you mean by coherent/inconherent?

The quasi-inverse definition that we originaly had is not a proposition, whereas bi-invertible is. One ofthe ways of fixing this is adding coherences as with the corerently-invertible definition in the HoTT track that we saw on Monday. For this reason, we also call the bi-invertible definition coherent. So bi-invertible is equivalent to coherently invertible, but not the previous definition.

Q2 Can we also go in the opposite direction and turn an equivalence into an isomorphism?

The two types are logically equivalent (so you can define maps in both directions), but not equivalent (the composites of these maps will not in general be homotopic to the identities)

Q3 Doesn't the HoTT book define apd_f before any of this stuff?

It is defined using the transport formulation

Q4 Why don't we just define the pathover notation as a synonym of transport?

That's what's done in the HoTT book. Dan outlined reasons like symmetry and similarity to Cubical

Q5 So: the natural numbers just contained terms, and its dependent eliminator accepted terms of the result family over those terms. The circle contains terms and paths between terms, and its dependent eliminator accepts paths over paths-between-terms. If we go to types that contain paths between paths-between-terms, is there a higher order PathOver type that we'll need to eliminate those types? Or do we keep using this PathOver because paths between paths are still paths?

In the HoTT book, the eliminator for the surf constructor of S^2 is pretty hard to work with. Cubical makes this *Much More Uniform*. See the discussion after 6.4.5

Q8 How did you figure out that that should be the invented lemma?

Drawing a schematic diagram often helps. Another approach is to decompose the type family into smaller pieces, and figure out transport/paths-over Lemmas for each.

Q6 Is there pattern matching for HITs to avoid having to use the elims?

Yes; in Cubical only!