Twitter Thread by Bruno Gavranovi■



Bruno Gavranovi■
@bgavran3



Hot take: optics are better abstraction than lenses, in *all* use cases. Why? They make explicit all the things you're implicitly thinking about anyway when using lenses. I think they are really important in shaping how we think about bidirectional maps. A short thread. ■ 1/9

Optics make explicit 1) the internal state (residual) and 2) the fact that you need to have the base category either be Cartesian, or at the very least have the "get" maps be comonoid homomorphisms. Let's look at the state/residual.
2/9

In lenses, this state is always the same as the input and is implicit. This can be seen by repackaging the get map from get: X → Y to Δ■;(get×X):X e→ Y×X. Now our new get map (in addition to computing the output) passes through the input. This is good for a few reasons. 3/9

First, this pleasantly symmetric with the put:X×Y'→X'. But also, this new map is now exactly the "left" map of an optic too. (It turns out put was all along the "right" map). This tells us that the passed-through input is actually the state we're remembering. 4/9

But most importantly, this formulation is now explicit in the use of the copy map Δ■:X → X×X, which you might have not realized is needed if you were just thinking about the standard get-put formulation. Furthermore, when you were composing lenses, ... 5/9

the formulation of the composite of the put maps was always much more complex than get maps. But now it's obvious why you needed to do that: you were juggling the internal state/residual around, because it had to agree with the input. 6/9

But you don't need to do that with optics (and that's the whole idea): you can *choose* the internal state you want.
With lenses you're using a specific state anyway, but you aren't given the conceptual tools to talk about it.
But let's stop here and see what we've done. 7/9

Observe that we didn't really "add" any complexity so far. All we've done is distilled what was already there and gave it a name. That's the whole idea behind of a lot of category theory. 8/9

Now, we still have to pack up this new construction and be precise in its definition. That's exactly what the coend in the optic definition does. It might even look scary, but it turns out the coend is saying some incredibly natural things. But that's for some other time. 9/9

References:
Optics: https://t.co/nWBhDR0Hut
Generalized Lens Categories: https://t.co/C0gB06B9DE
Also, this perspective was first shared with me here: https://t.co/ThvRcV2j3t

Also, I should add a caveat that I'm not necessarily talking about *mixed* optics. These seem like a complex beast that I don't yet understand fully.