Is Face Processing Special?

What's unique about the face-perception task?
- *requires very fine discriminations between individual exemplars to determine identity or expression. For other objects, typically between-class discriminations suffice. (within-class distinctions)*
- *We are overtrained on this task; many exemplars (expertise)*

Are there functional differences between face and object recognition?

S: Faces show the inversion effect – more difficult to recognize upside down; Perhaps because of holistic encoding right-side up and componential encoding when inverted. A 'diagnostic' feature of face recognition. No other objects show this effect.
Also, individual face parts better discriminated when presented in whole face than when presented alone. Perhaps due to holistic encoding.

NS: Inversion effects can be demonstrated with non-face objects too after sufficient practice. E.g. Greebles and Carey's study with dog experts.

S: But, there are alternative explanations for the Greebles result. Greebles are face like.
- **they look animate**
- **they have individual names reinforcing the tendency to see them as people**
- **their structure is quite similar to that of a face**

For the dog case, the data can not rule out the possibility of there being two mechanisms, one for faces and another for dogs, both of which function in similar ways, at least wrt inversion.

Is there an anatomically discrete face processing area?

Evidence from lesion studies:

S: Reports of a double dissociation:
CK: severe object agnosia but intact face processing. Can recognize upright faces just fine, but very impaired on inverted ones (perhaps because inverted faces are processed via regular object mechs.) Can not discriminate between airplanes and tin soldiers even though he was an expert at both before his accident. Thus, mechanisms sufficient for face recognition are not sufficient for other within-category discrimination tasks.
LH: severe face agnosia but fine object perception. Impaired at upright faces but as good as normals on inverted faces.
WJ: Sheep farmer who can recognize his sheep just fine but not faces.

NS: But, there are few, if any, cases of pure dissociation. Prosopagnosia is typically accompanied by problems in many other non-face fine discriminations as well (coins, cars)

S: Yes, but that may be simply because the object and face areas are nearby and often get damaged together. Sort of like an asteroid hitting Rhode Island and taking out a part of Massachusetts.

NS: How do you explain selective deficits in other object classes (like vegetables, buildings)? There's probably nothing special about faces. Rather, the object recognition system is organized into many modules corresponding to different object classes. Faces are just one of the classes. Sort of like a 'Society of Mind' model.
These modules are quite flexible in their development. Imaging studies show different modules in normal adults for letters and digits, but overlapped modules for mailmen. Logothetis has shown modules for artificial paper-clip objects after training.
Thus, since non-face objects may also have their own modules, there's nothing special about faces.

S: The face module may be special in that it is innate and bigger. Also, a multi-module model can hardly be called a domain general model.

Evidence from imaging data:

S: Face-specific activity.
McCarthy et al. – faces embedded in junk vs. faces embedded in objects. Bilateral regions of the fusiform gyrus activated by first, but an additional focal region of the right fusiform region activated by second.

NS: Why should there be this difference? Shouldn't the activations for both cases be the same (if faces are both objects and faces)?

S: Faces activate the face region more than twice as strongly as any other class of objects (including biological and non-biological ones). This result is obtained with fMRI, ERP and MEG.

NS: But this activation in the FFA might reflect fine discrimination rather than face discrimination per se. Greeble discrimination leads to activation of the FFA too.

S: But Greebles look like faces (see above).

NS: Okay, how about the increasing activation with expertise. Car and dog experts show higher activations for their expert categories.

S: Your methods are wrong. You are not looking at the FFA at all. And even when you are, the activations for faces are more than twice as strong than for the expert category. In general, within category discrimination is not sufficient to engage the FFA (hands, house discriminations lead to low activations). Also, expertise alone cannot account for FFA activation. The FFA responds poorly to letter strings or to photographs of indoor/outdoor scenes. The FFA IS face-specific. Just because the FFA participates in some other task, does not mean that it is a general mechanisms. It can't help participating in other tasks.

NS: Then why the difference in FFA activation based on level of expertise (cars, dogs)?

S: The modulation may be attention/interest based. Experts may be paying more attention to their expert categories. It is known that FFA activity is attention dependent. Also, cars and dogs produced activation in the PPA as well, thus indicating that they are not being interpreted as faces.

NS: What if I bring you data in the future that shows a correlation between FFA activity and level of expertise or within-category discrimination?

S: That won't help in dismantling the case against face specificity. First, the FFA might have two distinct but physically interleaved populations (evidence: individual neurons in IT are tuned to specific complex patterns that may be very different from their neighbors). Second, the activation in a given cortical area in an imaging study may not reflect neural computations necessary for the task.

NS: That sounds like having your cake and eating it too.

Evidence from single unit studies:

S: Most non-face cells permit simplification of their optimal stimuli, but face cells do not. It seems like they are working off different types of representations.

NS: Let's take this outside, buddy.