

## SUPPLEMENTARY MATERIAL

### A. ROI sizes and MNI coordinates

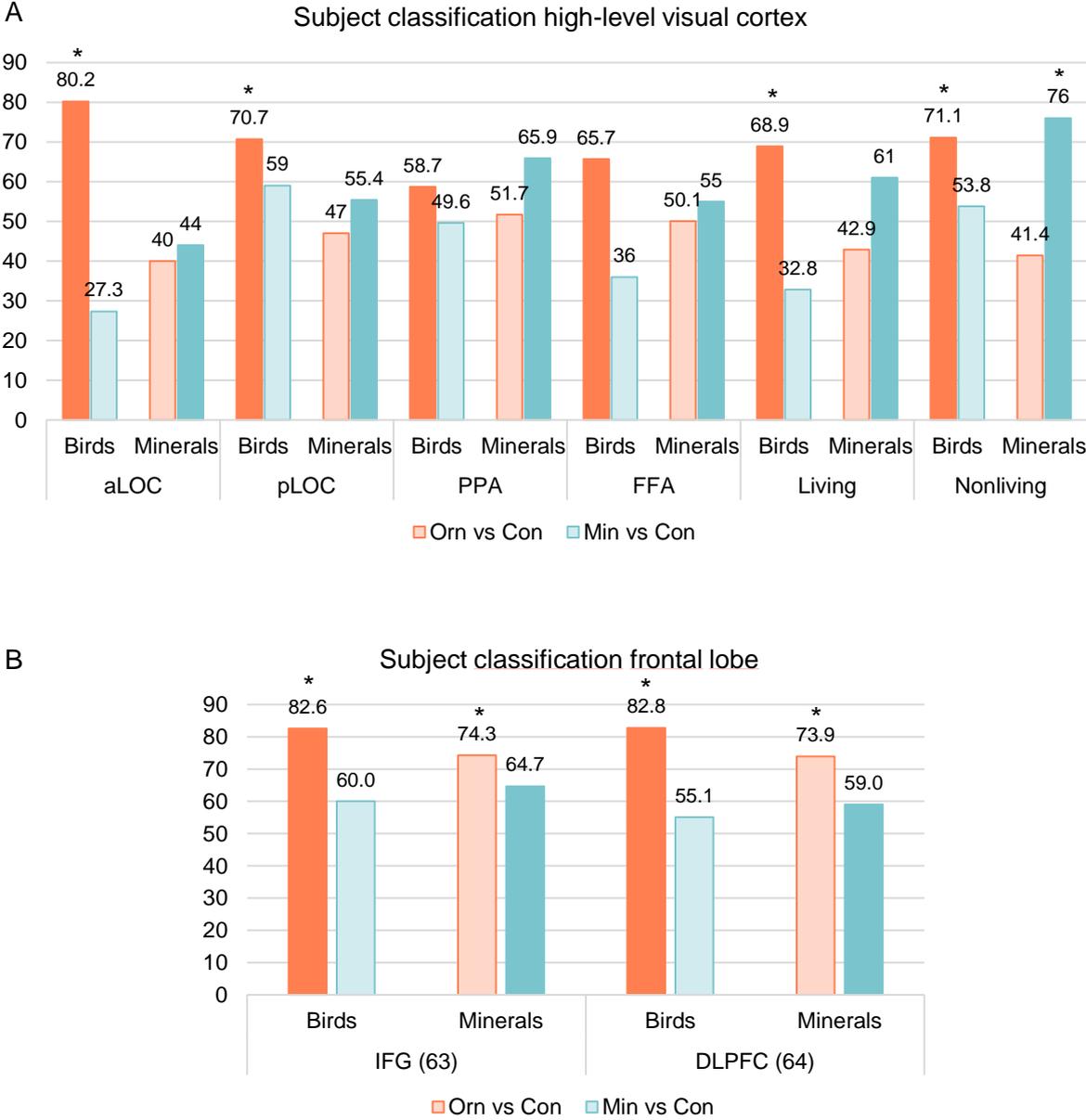
ROI	# subjects	size ( $\pm$ sd)	MNI coordinates ( $\pm$ sd)
<b>Anatomical ROIs</b>			
Low-level visual ROI	57	7042	/
High-level visual ROI	57	5462	/
Frontal lobe	57	42017	/
<b>Functional ROIs</b>			
FFA (left)	54	109 ( $\pm$ 74)	-42 $\pm$ 3, -55 $\pm$ 8, -19 $\pm$ 4
FFA (right)	56	182 ( $\pm$ 97)	44 $\pm$ 4, -53 $\pm$ 8, -19 $\pm$ 4
OFA (left)	38	56 ( $\pm$ 36)	-38 $\pm$ 5, -88 $\pm$ 4, -10 $\pm$ 4
OFA (right)	44	64 ( $\pm$ 56)	39 $\pm$ 5, -87 $\pm$ 3, -9 $\pm$ 4
PPA (left)	57	179 ( $\pm$ 101)	-25 $\pm$ 5, -48 $\pm$ 7, -9 $\pm$ 4
PPA (right)	57	258 ( $\pm$ 114)	27 $\pm$ 5, -47 $\pm$ 9, -10 $\pm$ 4
pLOC (left)	57	286 ( $\pm$ 150)	-41 $\pm$ 5, -85 $\pm$ 5, -6 $\pm$ 7
pLOC (right)	57	299 ( $\pm$ 166)	41 $\pm$ 5, -84 $\pm$ 5, -5 $\pm$ 6
aLOC (left)	57	341 ( $\pm$ 231)	-37 $\pm$ 7, -54 $\pm$ 10, -16 $\pm$ 5
aLOC (right)	57	350 ( $\pm$ 249)	40 $\pm$ 7, -56 $\pm$ 10, -16 $\pm$ 6
Living (left)	57	111 ( $\pm$ 73)	-43 $\pm$ 3, -59 $\pm$ 7, -17 $\pm$ 4
Living (right)	56	158 ( $\pm$ 79)	45 $\pm$ 4, -56 $\pm$ 7, -18 $\pm$ 4
Living – FFA (left)	42	60 ( $\pm$ 36)	-43 $\pm$ 4, -60 $\pm$ 7, -16 $\pm$ 4
Living – FFA (right)	42	73 ( $\pm$ 40)	45 $\pm$ 4, -58 $\pm$ 6, -16 $\pm$ 4
Nonliving (left)	56	108 ( $\pm$ 72)	-28 $\pm$ 3, -52 $\pm$ 7, -11 $\pm$ 4
Nonliving (right)	56	108 ( $\pm$ 78)	30 $\pm$ 4, -50 $\pm$ 7, -11 $\pm$ 4

**Table S1** displays, for each ROI, the number of subjects in which this ROI was outlined, the mean and standard deviation (sd) of the number of voxels and the mean and standard deviation of the MNI coordinates.

### B. Subject classification analyses in smaller ROIs

We a priori decided to perform MVPA in the larger anatomical ROIs, assuming that we would have more sensitivity to make inferences about domain specificity in these larger ROIs. Post hoc we also performed some of the analyses in the smaller functional ROIs. In the graphs below (fig. S1), we show the results of the subject classification analyses in the following smaller ROIs: the high-level visual regions (anterior and posterior LOC, PPA, FFA and the Living and Nonliving regions) and two subregions of the frontal lobe (dorsolateral prefrontal cortex (DLPFC) and inferior frontal gyrus (IFG)). Overall, the results suggest that the expertise effects that we have demonstrated in the larger anatomical ROIs seem to be distributed across the smaller subregions instead of localized within one specific (functional) ROI. In the high-level visual regions, bird expertise effects are present in aLOC, pLOC, the Living and the Nonliving region, while mineral expertise effects can only be found in the Nonliving region (when correcting for multiple comparisons), thus reflecting the whole-brain univariate results. In the frontal regions, bird expertise effects are present in both subregions while there are no mineral expertise effects (cfr. subject

classification results in the frontal lobe). However, many of the effects hover around the statistical threshold in these smaller ROIs (overall lower classification performance compared to the larger anatomical ROIs). Given the lower sensitivity in these smaller ROIs, we refrain from drawing strong conclusions.



**Figure S1.** Results for the subject classification analyses in subregions of the high-level visual cortex (A) and the frontal lobe (B). Bars depict the classification accuracies in percentages. The dark bars indicate the potential expertise effects (e.g. classification of ornithologists (orn) vs controls (con) based on their activation for birds). Significant classification accuracy (after FDR correction) is indicated with an asterisk.

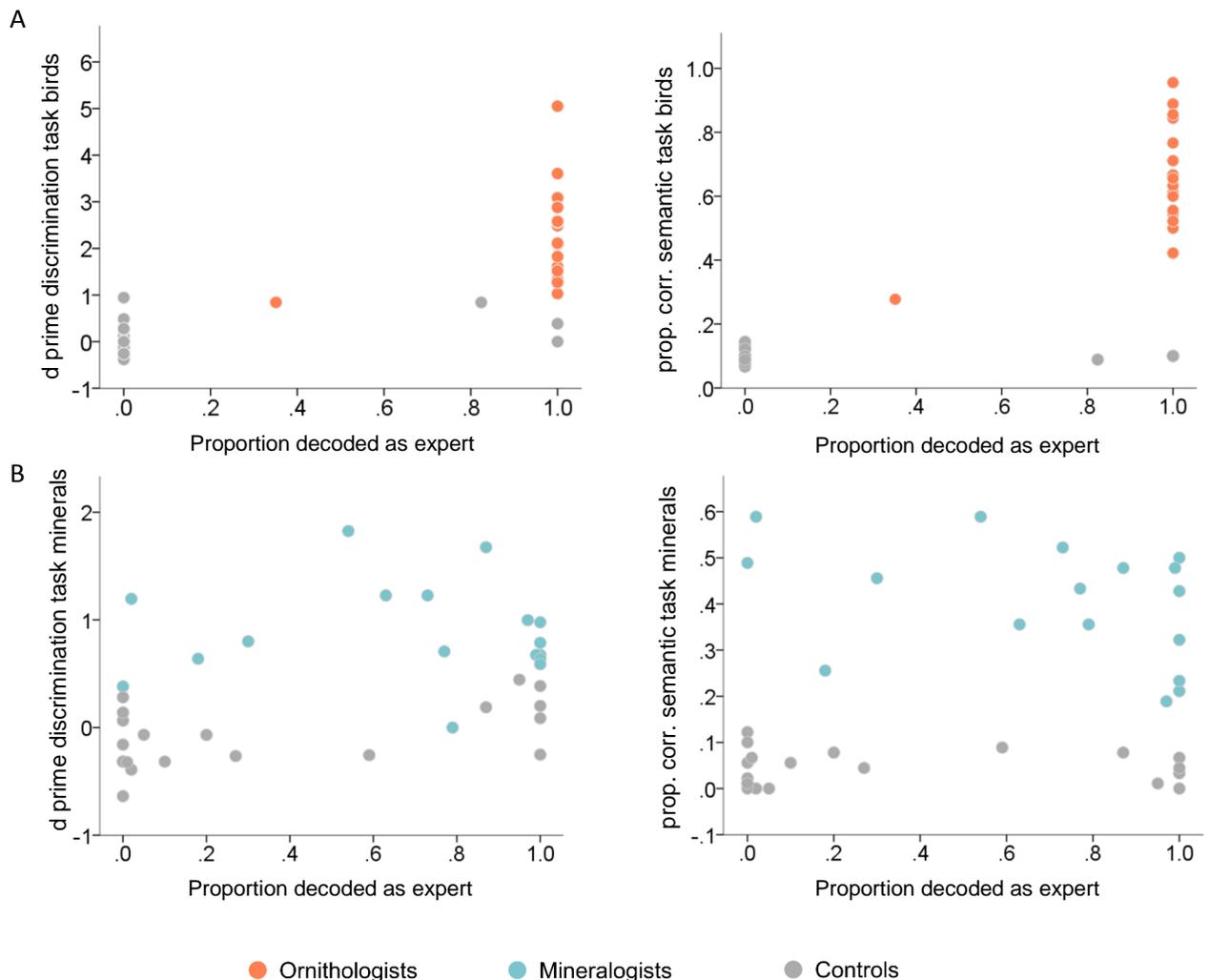
We also included the brain-behavior correlations (correlations between the proportion of times each participant was decoded as an expert and the participants' scores on the behavioral tasks) for the smaller ROIs (table S2). Again, given the lower sensitivity, it is hard to interpret these findings. The results for the smaller ROIs confirm most of what we see in the large ROIs, but with some variability

between ROIs. Given that this variability might in large part be due to noise fluctuations in the data, which is why we prefer to restrict conclusions to the larger ROIs.

Classification	Behavioral task		aLOC	pLOC	PPA	FFA	Living	Nonliving	IFG	DLPFC
Orn. vs Con.	Discrimination birds	r	0.54	0.50	0.24	0.35	0.29	0.30	0.39	0.48
		p	0.000	0.001	0.131	0.027	0.074	0.059	0.012	0.002
	Semantic birds	r	0.54	0.55	0.26	0.39	0.35	0.43	0.53	0.61
		p	0.0004	0.0002	0.111	0.013	0.025	0.006	0.0004	< 0.0001
Min. vs Con.	Discrimination minerals	r	-0.12	0.16	0.26	-0.10	0.01	0.41	0.38	0.34
		p	0.491	0.353	0.121	0.562	0.968	0.011	0.019	0.042
	Semantic minerals	r	-0.20	0.06	0.25	0.09	0.21	0.45	0.33	0.24
		p	0.239	0.746	0.132	0.577	0.209	0.005	0.050	0.151

**Table S2.** Correlations between the “proportion decoded as expert” and the participants’ behavioral scores for the high-level visual and frontal subregions. Regions in which the subject classification accuracy was significant, are indicated by a frame, significant correlations are highlighted in green.

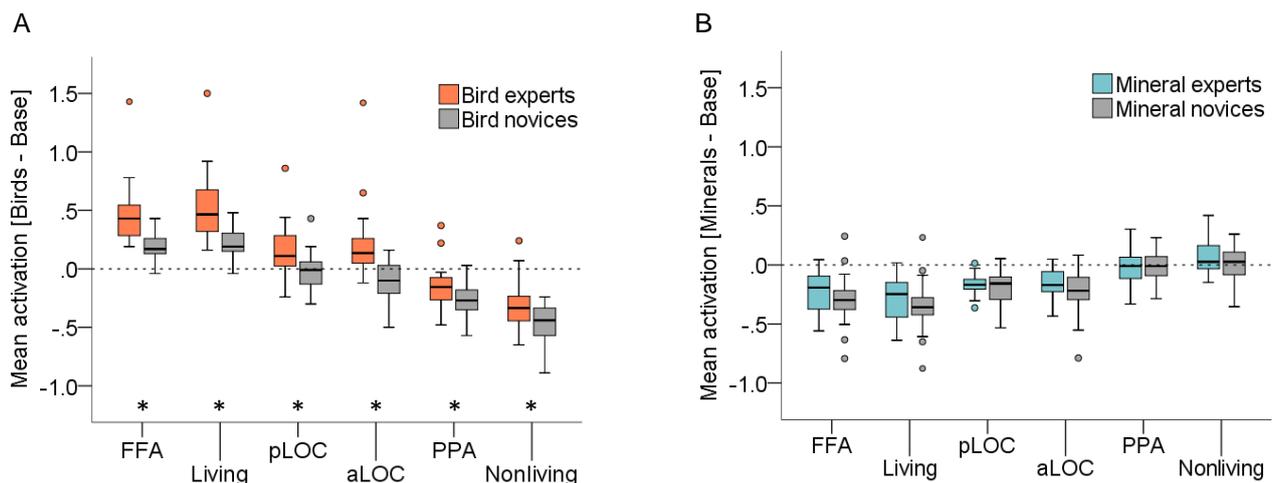
### C. Scatterplots depicting the relation between the “proportion decoded as expert” and behavioral scores

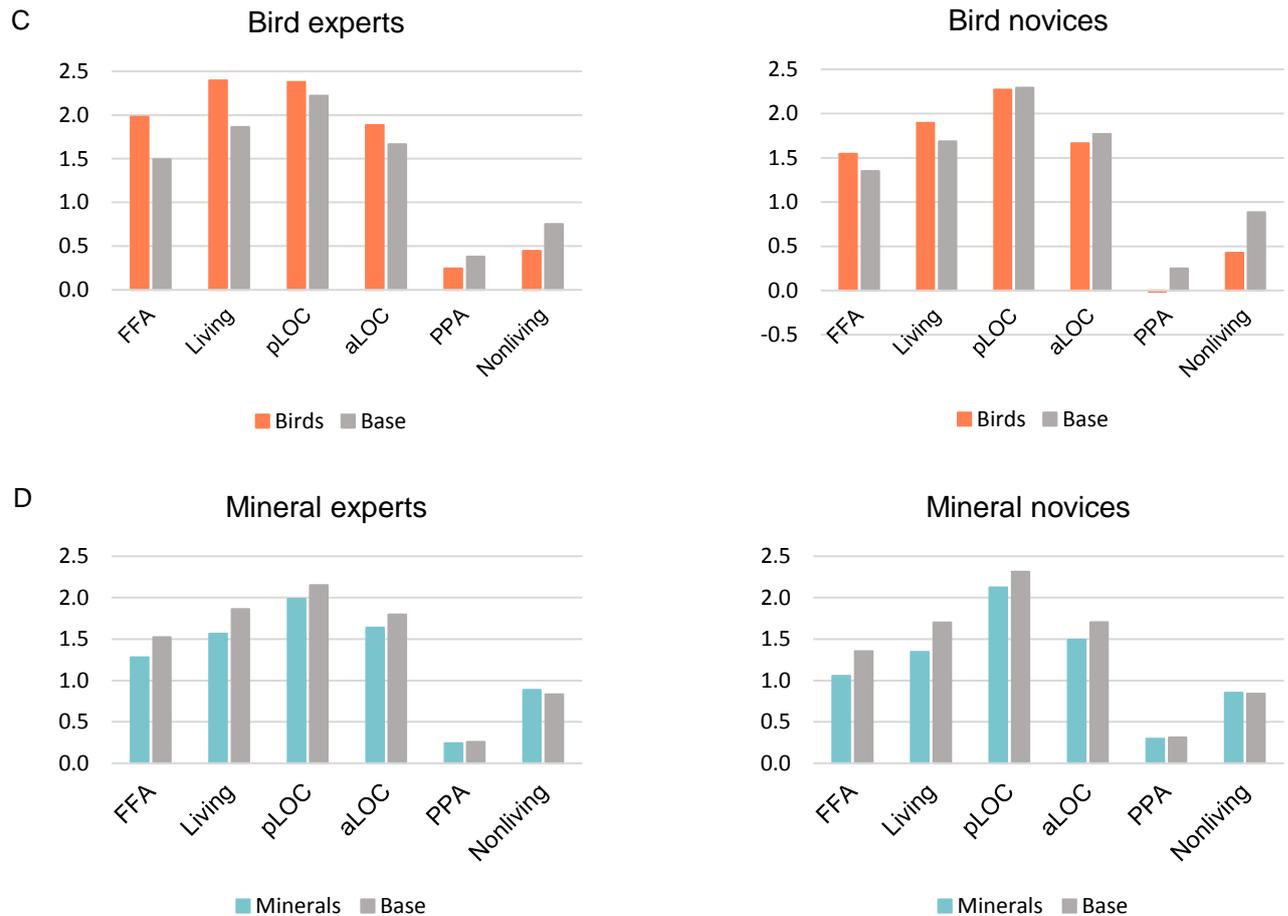


**Figure S2.** (A) Scatterplots depicting the relation between the ornithologists' and control participants' scores on the bird discrimination task and semantic task for birds on the one hand and the proportion of times each participant was classified as being an ornithologist in the high-level visual aROI on the other hand. (B) Scatterplots depicting the relation between the mineralogists' and control participants' scores on the mineral discrimination task and semantic task for minerals on the one hand and the proportion of times each participant was classified as being a mineralogist in the high-level visual aROI on the other hand.

#### D. Univariate ROI analyses: breakdown of activation for expert condition and base condition

In the bar graphs below (fig. S3) we have broken down the single difference bars depicting the mean activation for the contrast [*expert condition* – *base condition*] in experts and novices into the constituting two bars (activation for expert condition and activation for base condition). The base condition is calculated by averaging the activation for the living and nonliving conditions. The graphs show that both expert object categories (birds and minerals) elicit a response in (almost) all of the functional ROIs in both experts and novices. However, the response elicited by the base condition is higher than the response for minerals in both mineral experts and novices and the same is true for the bird activation in PPA and the Nonliving region in bird experts and novices. This result is in line with the results found by McGugin et al. (2012), who show that activation for cars in car experts (in FFA) is actually negative when compared to an “animal” baseline. Nevertheless, they do show the presence of an expertise effect by calculating correlations between the activation for cars and a behavioral measure of car expertise. The neutral base condition that we have used is also a “high-level” condition, and it is not surprising that our ROIs show a high response for this condition. For example: when looking at the bird experts' and novices' response for the base condition in PPA and the Nonliving region, we see that this response is higher than the response for birds. However, since the base condition is partly made up out of activation for nonliving objects (the preferred object category for PPA and the Nonliving region), this finding is not surprising. The increased activation for birds (even when compared to a “high-level” base condition) in bird experts compared to bird novices is what indicates the presence of an expertise effect.





**Figure S3.** (A) Mean activation for the [birds - base] contrast for bird experts and bird novices (mineralogists and control participants) in 6 functionally defined ROIs. (B) Mean activation for the [minerals - base] contrast for mineral experts and mineral novices (ornithologists and control participants). Significant differences between the subject groups in panels A and B are indicated by an asterisk. Note that these panels are also presented in Figure 7 in the main manuscript. (C) Mean activation for the conditions birds and base separately in bird experts and bird novices. (D) Mean activation for the conditions minerals and base separately in mineral experts and mineral novices.

**References:**

Gauthier I, McGugin RW, Gatenby C, Gore JC (2012) High-resolution imaging of expertise reveals reliable object selectivity in the FFA related to perceptual performance. *J Vis* 12:1281–1281.