

**Supplementary Table. Problems of benchmarked methods for integration of SS2 and 10X datasets from Tabula Muris, Tabula Microcebus and Human Lung Cell Atlas.**

Dataset		Figure	Method								
			scVI	ZINB-WaVE	BBKNN	BUSseq	LIGER	Harmony	MNN	Scanorama	
Tabula Muris	Aorta	Supplementary Fig. 8	inadequate mixing	inadequate mixing				inappropriate mixing of the cardiac muscle cells and erythrocytes			
	Bladder	Supplementary Fig. 9	inadequate mixing	inadequate mixing	inadequate mixing	inadequate mixing					
	Limb muscle	Supplementary Fig. 10	inadequate mixing	inadequate mixing	inadequate mixing						
	Liver	Supplementary Fig. 11	inadequate mixing	inadequate mixing							
	Lung	Supplementary Fig. 12	inadequate mixing	inadequate mixing		inadequate mixing					
	Mammry gland	Figure 2	inadequate mixing	inadequate mixing	inadequate mixing low ARI		inappropriate mixing of the B cells, macrophages and T cells				
	Marrow	Supplementary Fig. 13	inadequate mixing	inadequate mixing		discretization of the granulocytes and granulocytopenic cells					
	Spleen	Supplementary Fig. 14								inadequate mixing	
	Trachea	Supplementary Fig. 15		inadequate mixing		discretization of the mesenchymal cells		discretization of the mesenchymal cells			
Tabula Microcebus	lemur 1	Blood	Supplementary Fig. 16	inadequate mixing			discretization of the neutrophils	discretization of the neutrophils	small clusters and low ARIs		
		Brain	Supplementary Fig. 17	inadequate mixing					small clusters and low ARIs		
		Lung	Supplementary Fig. 18	inadequate mixing				discretization of the neutrophils	small clusters and low ARIs		
	lemur 2	Bladder	Supplementary Fig. 19	inadequate mixing						small clusters and low ARIs	
		Blood	Supplementary Fig. 20	inadequate mixing		inadequate mixing	discretization of the neutrophils	inappropriate mixing of the capillary cells and neutrophils			
		Bone marrow	Supplementary Fig. 21	inadequate mixing	inadequate mixing			discretization of the neutrophils			
		Kidney	Supplementary Fig. 22	inadequate mixing	inadequate mixing						
		Lung	Supplementary Fig. 23	inadequate mixing	inadequate mixing		inadequate mixing				
		Spleen	Supplementary Fig. 24	inadequate mixing	inadequate mixing	inadequate mixing	inadequate mixing				inadequate mixing
		Bladder	Supplementary Fig. 25	inadequate mixing							
	lemur 4	Bone	Supplementary Fig. 26	inadequate mixing	inadequate mixing						
		Bone marrow	Supplementary Fig. 27				discretization of cells of the same type				
		Eye retina	Supplementary Fig. 28	inadequate mixing			inadequate mixing				
		Heart	Supplementary Fig. 29						small clusters		

Tabula Microcebus	lemur 4	Kidney	Supplementary Fig. 30	inadequate mixing	inadequate mixing			inappropriate mixing of the subtypes of natural killer cells and the T-cells				
		Liver	Supplementary Fig. 31	inadequate mixing					small clusters			
		Pancreas	Supplementary Fig. 32	inadequate mixing							small clusters and low ARIs	
		Small intestine	Supplementary Fig. 33	inadequate mixing	inadequate mixing				inappropriate mixing of the subtypes of natural killer cells and the T-cells			
		Spleen	Supplementary Fig. 34	inadequate mixing	inadequate mixing					inappropriate mixing of the eosinophils and B cells		inadequate mixing
		Testes	Supplementary Fig. 35	inadequate mixing	inadequate mixing			discretization of the pachytene spermatocytes, round spermatids, elongating spermatids, and elongated spermatids				
		Tongue	Supplementary Fig. 36	inadequate mixing						inappropriate mixing of the basal cells and the suprabasal cells		
Human Lung Cell Atlas		Supplementary Fig. 37	inadequate mixing	inadequate mixing	inadequate mixing	inadequate mixing		inappropriate mixing of the natural killer cells and the T-cells				