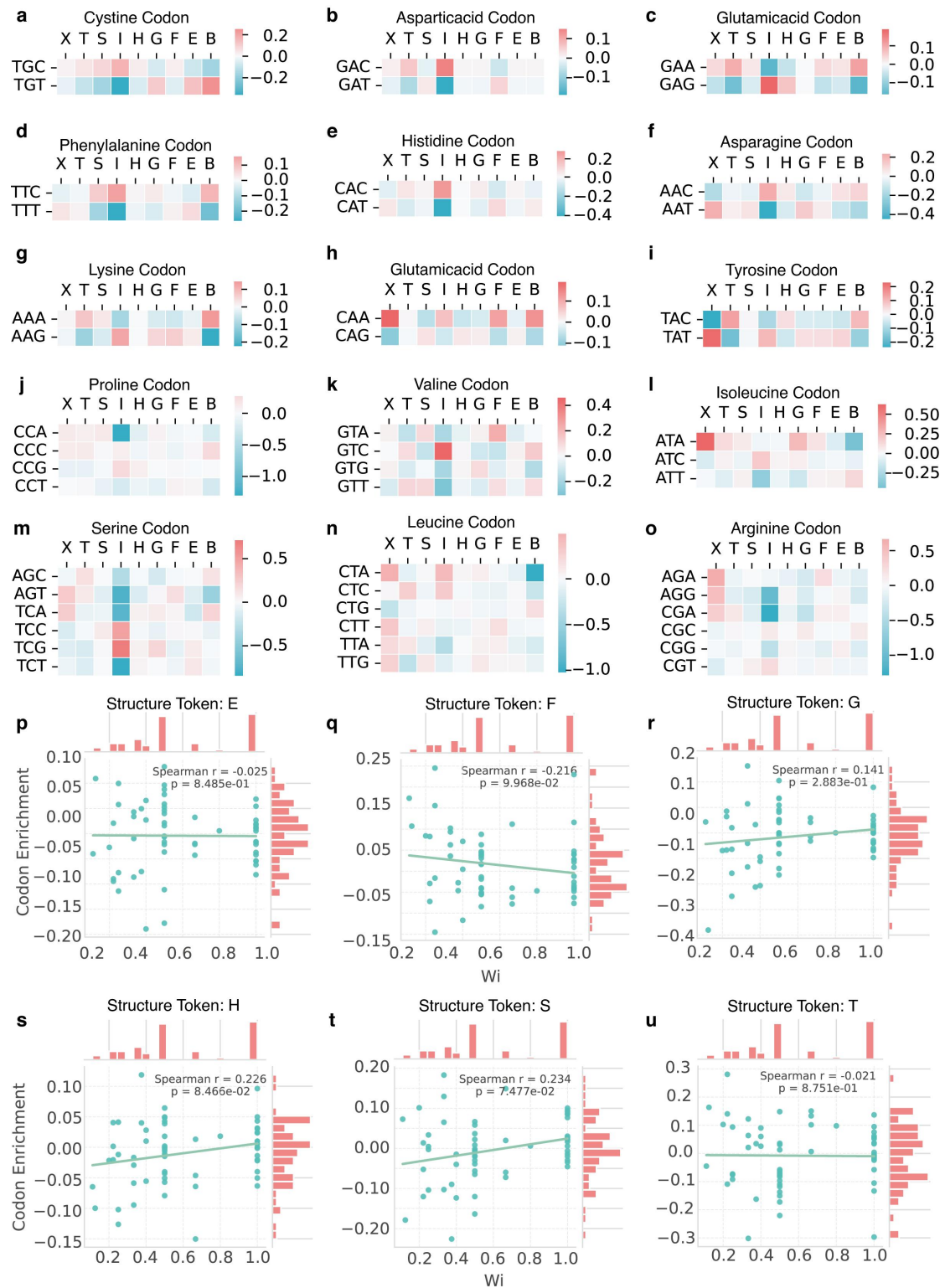




Extended Data Fig. 1: **Analysis of Codon Usage Bias and Structural Token Correlation.** **a–o**, Specific codon enrichment across different structural states. Heatmaps showing the enrichment or depletion levels of synonymous codons (vertical axis) relative to the DSST structural tokens (horizontal axis: X, T, S, I, H, G, F, E, B) for 15 amino acids. The color scale represents the enrichment score (log-ratio or normalized frequency), where red indicates positive enrichment and blue indicates depletion in a specific

structural context. **p–u**, Correlation between codon adaptation index (W_i) and structural enrichment. Scatter plots with marginal histograms illustrating the relationship between the relative adaptiveness of a codon (W_i , horizontal axis) and its enrichment score within specific structural tokens: E (extended strand), F (loop), G (3_{10} -helix), H (α -helix), S (bend), and T (hydrogen-bonded turn).