Astrocytes contribute to the development and regulation of the higher-level brain functions, the critical targets of evolution. However, how astrocytes evolve in primates is unsettled. Ciuba et al. obtained human, chimpanzee, and macaque induced pluripotent stem cell-derived astrocytes (iAstrocytes). Human iAstrocytes are bigger and more complex than the non-human primate iAstrocytes. They identified new loci contributing to the increased human astrocyte. They showed that genes and pathways implicated in long-range intercellular signalling are activated in the human iAstrocytes and partake in controlling iAstrocyte complexity. Genes downregulated in human iAstrocytes frequently relate to neurological disorders and were decreased in adult brain samples. Through regulome analysis and machine learning, they uncover that functional activation of enhancers coincides with a previously unappreciated, pervasive gain of “stripe” transcription factor binding sites. Altogether, they revealed the transcriptomic signature of primate astrocyte evolution and a mechanism driving the acquisition of the regulatory potential of enhancers [1)]

1)
Ciuba K, Piotrowska A, Chaudhury D, Dehingia B, Duński E, Behr R, Soroczyńska K, Czystowska-Kuźmicz M, Abbas M, Bulanda E, Gawlik-Zawiślak S, Pietrzak S, Figiel I, Włodarczyk J, Verkhratsky A, Niedbała M, Kaspera W, Wypych T, Wilczyński B, Pękowska A. Molecular signature of primate astrocytes reveals pathways and regulatory changes contributing to human brain evolution. Cell Stem Cell. 2025 Jan 29:S1934-5909(24)00458-2. doi: 10.1016/j.stem.2024.12.011. Epub ahead of print. PMID: 39909043.