The “Local Group” of Galaxies

Note that no single galaxy marks the dynamical center (this is typical of “groups”)

Galaxies are Gregarious
(prefer to live in small “groups” or big “clusters”)

Small portion of the Virgo Cluster, the closest large galaxy cluster (contains about 1,500 galaxies, distance about 60 Mly)

Coma Cluster (d = 80 Mpc/h; 15’ x 15’; 0.35 Mpc/h on each side)

Virgo Cluster (d = 12 Mpc/h; 60’ x 60’; 0.21 Mpc/h on each side)
The Monster at the center of Virgo

M87 is one of the most massive galaxies in the universe (~10^{13} M_{\odot}), and harbors one of the most massive black holes in the universe (~3x10^9 M_{\odot}).

M87 - cD galaxy at center of Virgo Cluster (note the "extended envelope" of light)

cD Galaxies - The Biggest of the Big

Line: deV law

A2218

Galaxy Cluster Abell 2218

NASA, A. Fruchter and the ERO Team (STScI, ST-ECF) • STScI-PRC00-06
Fritz Zwicky - a man WAY ahead of his time (mid 1930’s)

Core of Coma Cluster (optical)

X-ray gas shows "substructure" (big surprise when it was discovered)