Spin glassy behaviors and isolated spin dimers in $\text{BaCr}_{9p}\text{Ga}_{12-9p}\text{O}_{19}$ JUNJIE YANG, ANJANA SAMARAKOON, KYUN WOO HONG, SEUNG-HUN LEE, Department of Physics, University of Virginia, Charlottesville, VA 22903, USA, JOHN R. D. COPLEY, QINGZHEN HUANG, NIST Center for Neutron Research, Gaithersburg, Maryland 20899, USA, TAKU J SATO, IMRAM, Tohoku University, Katahira, Sendai 980-8577, Japan — Theoretical results suggested that quantum fluctuations may induce glassy states (spin jam states) in defect-free spin systems. Recently our experimental results indicated the existence of spin jam states in SrCr$_{9p}$Ga$_{12-9p}$O$_{19}$ (SCGO($p$)) in which the Cr$^{3+}$ ions form two-dimensional (2D) triangular lattice of bi-pyramids. Here we report a isostructural new system BaCr$_{9p}$Ga$_{12-9p}$O$_{19}$ (BCGO($p$)) with 0.4<$p$<0.9. Neutron diffraction results show that BCGO($p$) is isostructural as SCGO($p$) but with a larger lattice indicating that BCGO($p$) is more 2D. BCGO($p$) exhibits similar glassy behaviors as SCGO($p$) but with higher freezing temperature. Very high Curie-Weiss temperature and frustration index were also observed in BCGO($p$) suggesting that BCGO($p$) is one of the most frustrating system. Inelastic neutron scattering results show that BCGO($p$) has dispersionless magnetic excitations at an energy of 16.5(1) meV arising from $4f_{vi}$-$4f_{vi}$ spin dimers. These spin dimers are adjacent spins in neighboring triangular lattice planes which separate the 2D interacting triangular lattice of bi-pyramids. These results indicate that BCGO($p$) is a new good candidate for studying spin jam states.