Gillardite $Cu_3NiCl_2(OH)_6$

Crystal Data: Hexagonal. *Point Group*: $\bar{3}$ 2/*m*. As aggregates of equant rhombohedral crystals to 0.5 mm.

Physical Properties: *Cleavage*: Good on {10*1}. *Tenacity*: Brittle. *Fracture*: Splintery and uneven. Hardness = 3 D(meas.) = n.d. D(calc.) = 3.76 Nonfluorescent.

Optical Properties: Transparent. *Color*: Dark green to nearly black. *Streak*: Green.
Luster: Vitreous.
Optical Class: Uniaxial (+). ω = 1.836(2) ε = 1.838(2) Nonpleochroic.

Cell Data: *Space Group*: $R\bar{3}\,m$. a = 6.8364(1) c = 13.8459(4) Z = 3

X-Ray Diffraction Pattern: 123 North deposit, Widgiemooltha, Western Australia, Australia.
5.459 (100), 2.753 (69), 2.256 (39), 2.901 (19), 4.648 (16), 2.725 (14), 1.818 (13)

Chemistry:

	(1)
CuO	55.6
NiO	15.3
CoO	0.2
FeO	0.1
Cl	17.3
H_2O	13.1
-O = Cl	3.9
Total	97.7

(1) 123 North deposit, Widgiemooltha, Western Australia, Australia; average electron microprobe analysis, H_2O by TGA; normalized corresponds to $(Cu_{3.08}Ni_{0.90}Co_{0.01}Fe_{0.01})_{\Sigma=4.00}Cl_2(OH)_{5.96}$.

Polymorphism & Series: Solid-solution series with Ni-rich paratacamite.

Occurrence: In silicified ferruginous gossan developed on a komatiite-hosted sulfide deposit.

Association: Ni-bearing clinoatacamite.

Distribution: 123 North deposit, 5 km north-northwest of Widgiemooltha, Western Australia, Australia.

Name: Honors Professor Robert David *Gillard* (b. 1936), formerly of the Department of Chemistry, Cardiff University, Wales, UK, for his contributions to inorganic coordination chemistry.

Type Material: Gartrell Collection, Department of Earth and Planetary Sciences, Western Australian Museum, Perth Cultural Centre, Perth, Australia (8774).

References: (1) Colchester, D.M., P. Leverett, M.E. Clissold, P.A. Williams, D.E. Hibbs, and E.H. Nickel (2007) Gillardite, $Cu_3NiCl_2(OH)_6$, a new mineral from the 132 North deposit, Widgiemooltha, Western Australia. Australian J. Mineral., 13, 15-18. (2) Clissold, M.E., P. Leverett, P.A. Williams, D.E. Hibbs, D.E. Nickel, H. Nickel (2007) The structure of gillardite, the Ni-analog of herbertsmithite, From Widgiemooltha, Western Australia. Can. Min., 45, 317-320. (3) (2008) Amer. Mineral., 93, 252-253 (abs. ref. 2). (4) Sciberras, M.J., P. Leverett, P.A. Williams, J. Schlüter, T. Malcherek, M.D. Welch, P.J. Downes, D.E. Hibbs, and A.R. Kampf (2017) Structural and compositional variations of basic Cu(II) chlorides in the herbertsmithite and gillardite structure field. Mineral. Mag., 81, 123-134.