Research group in Atom Probe TOmography and Reconstruction

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Making Invisible Gold Visible:

insights from Atom Probe Tomography into Carlin-type gold mineralization

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Further information can be found in our 2019 paper in Economic Geology

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A Nanoscale Investigation of Carlin-Type Gold Deposits: An Atom-Scale Elemental and Isotopic Perspective

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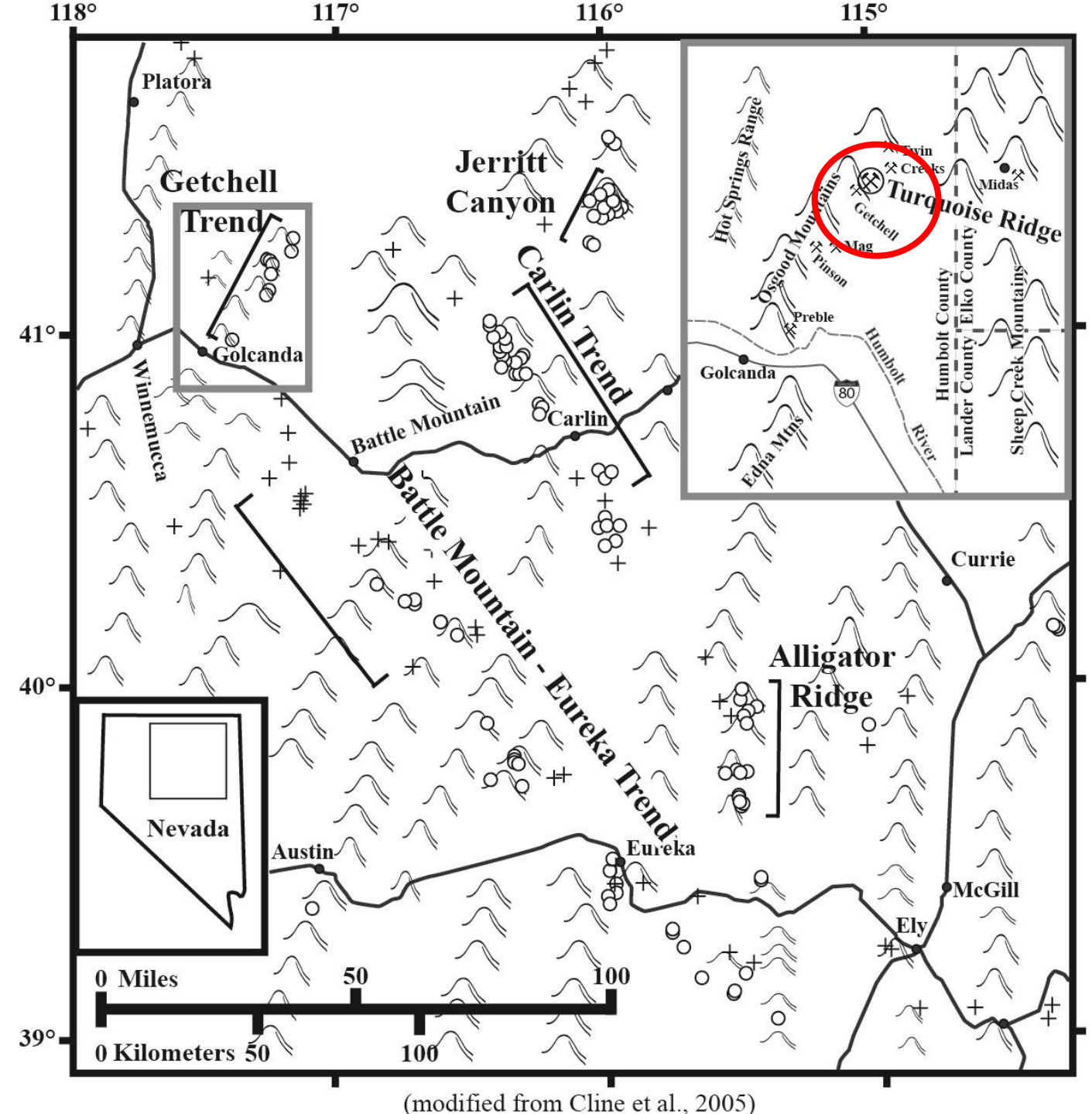


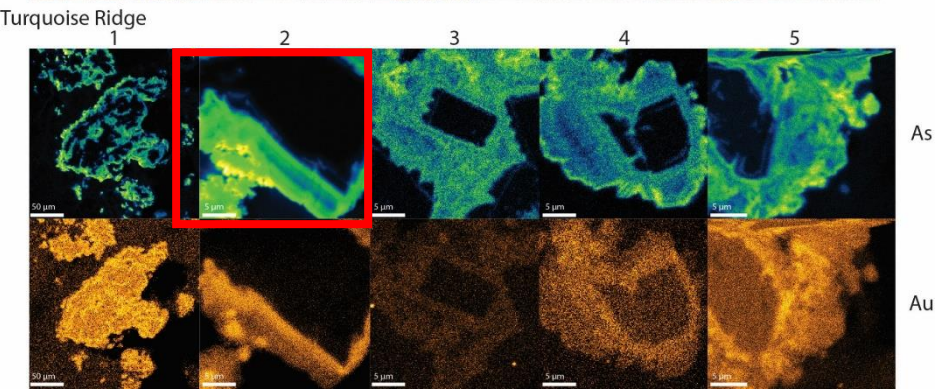
(modified from Cline et al., 2005)

Carlin

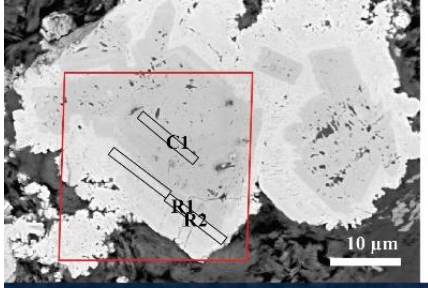
Characteristics

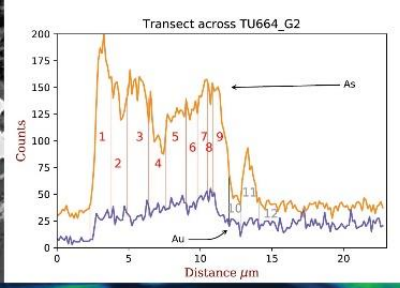
- **Low silver: gold ratios, low base metals**
- **Typical age of deposits in Nevada is ~42-36 Mya**
- **Hosted in silty carbonate rocks**
- **Occur as NW-SE trends in central Nevada (and China)**
- **Sub-micron sized gold hosted in sulfides but disseminated in deposit**

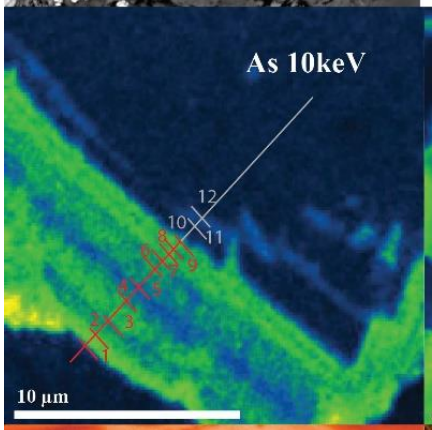
(Gopon, et al., 2019)

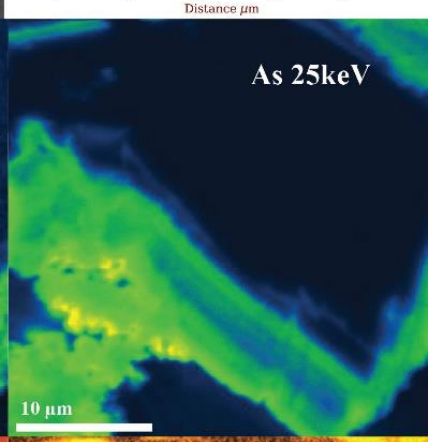


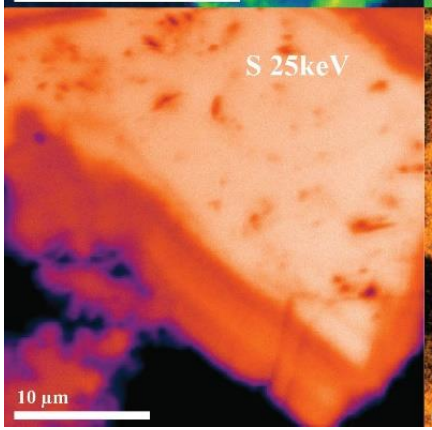
(Gopon et al., 2019)

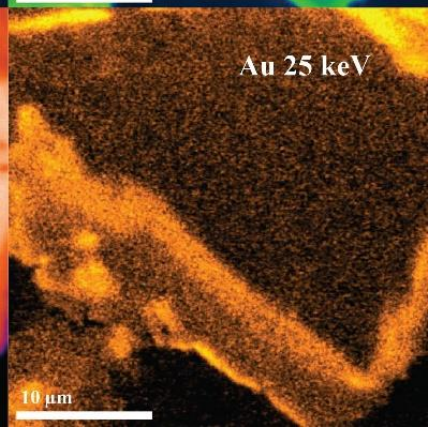




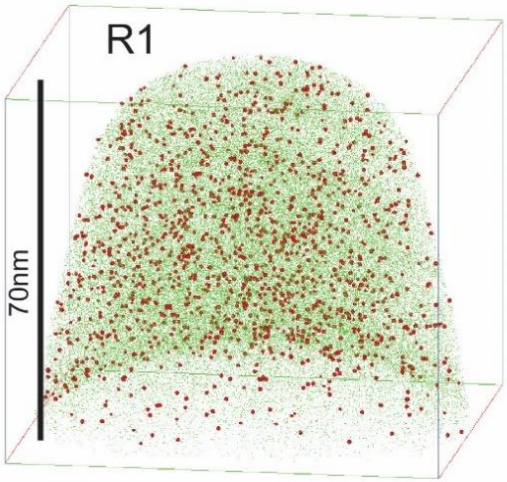


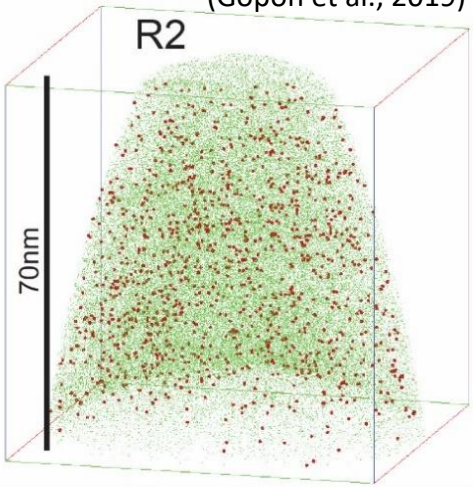


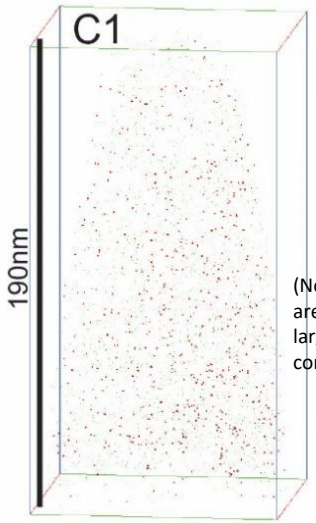




(Gopon et al., 2019)







As
Au

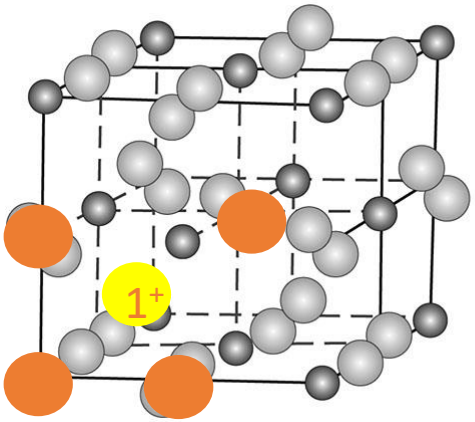
(Only As and Au shown)

(Note Au atom are displayed larger for contrast)

	M8 (L3)	M4 (L3)	M11 (L2)
	R1	R2	C1
	at. %	*at. %*	*at. %*
S	57.16	56.74	64.09
Fe	34.23	36.93	34.40
As	6.07	4.87	0.01
Ni	0.69	0.37	0.41
Zn	0.27	0.13	0.24
	at. ppm	*at. ppm*	*at. ppm*
Cu	517	193	45
Au	258	178	4
K	238	164	128
Co	204	116	133
Hg	55	35	0
Pb	28	22	3
Sn	13	11	6
$^{34}S/^{32}S$ (AsS)	**0.0442**	**0.0438**	-
$^{34}S/^{32}S$ (S2)	**0.0446**	**0.0446**	**0.0503**

-APT sequentially evaporates individual atoms onto a time and position sensitive detector.
(see Gault, Moody, Cairney, and Ringer, 2012 (book) for full description of technique)

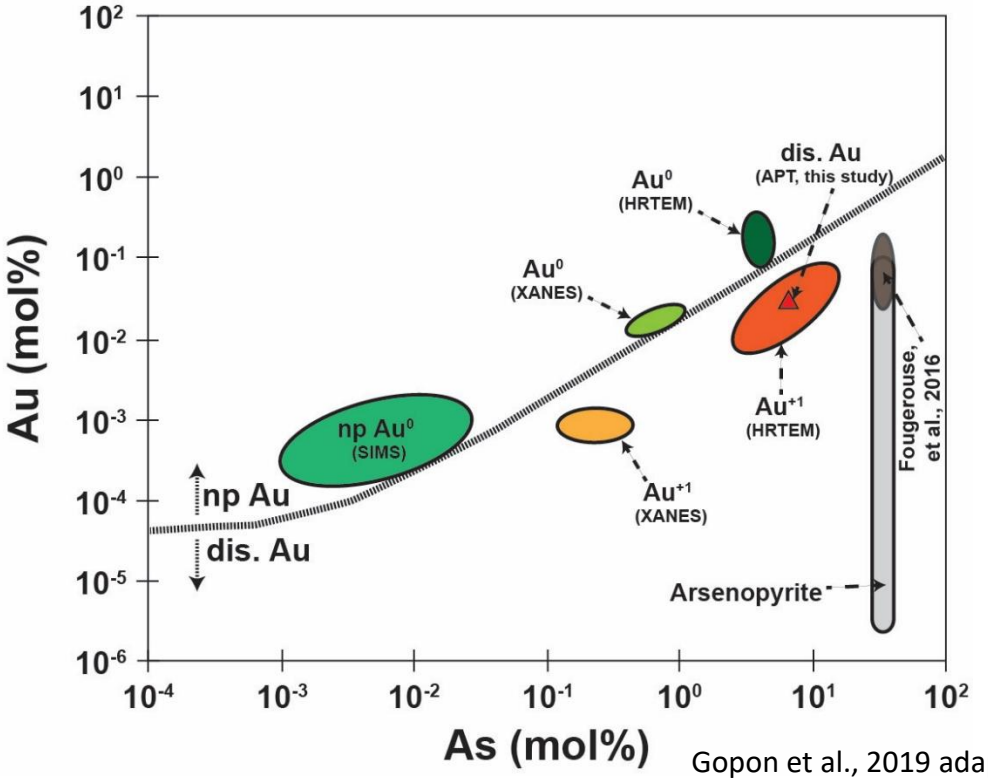
-3D reconstruction of the sample gives major, minor, and isotopic info. at the atomic scale



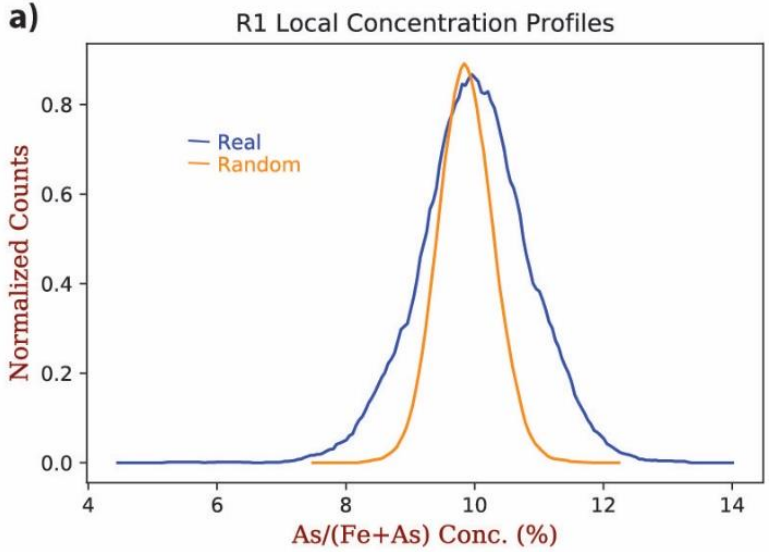
Iron (Fe)

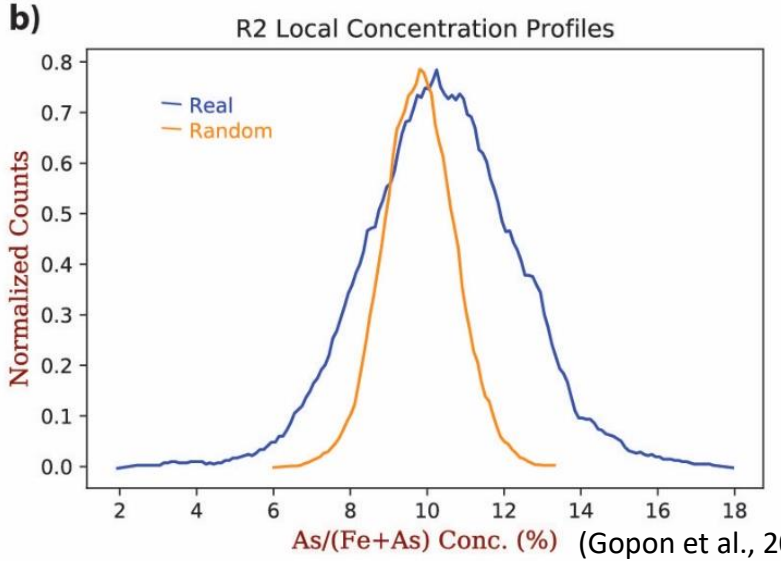
Sulfur (S)

Atomic Distribution



Gopon et al., 2019 adapted from Reich, 2005





(Gopon et al., 2019)

Local concentrations surrounding Au ions shows an increase in As concentration