

### **Uinta-Gold Hill zone**

*Uinta-Cortez axis* of Roberts and others (1965)/ see Presnell, 1997. Local expressions include the Tooele arch and Stansbury disturbance. Kwon and Mitra (2004) call it *Uinta-Cortez zone* on their figure. The eastern part is called the *Uinta-Cottonwood arch* (other refs). *Uinta trend* (Bryant and Nichols, 1988).

Basement suture/crustal boundary is coincident with the UC axis (Roberts et al 1965 in Presnell 1997). Boundary was active at different times in Proterozoic and Phanerozoic, resulting in significant differences in the miogeoclinal sedimentary packages north and south of this zone. During Sevier thrusting boundary served as a large, steep lateral ramp (Bruhn et al 1986; Paulsen and Marshak). Left-lateral movement and oblique shortening structures. Zone was later reactivated.

Lines of evidence from Tooker (Don Mabey 2002 Review of Tooker unpublished paper on Oquirrh Mtns) include: (1) evidence of suture in Precambrian basement, (2) evidence of Tertiary uplift in the Bingham area, (3) zone of igneous rocks extending west from Park City, (4) irregular, local uplifts in western Utah and Nevada during the Paleozoic, (5) geophysical evidence, in the Tooele 1x2 degree quadrangle.

*Oquirrh-Uinta transverse zone* (Rowley, 1998). Many other names used for mineral trends, but extends from Uinta Mtns to Gold Hill (Deep Creeks).

Cashman (1992) reports sense of fold curvature relative to thrust transport direction in Stansbury Mtns is opposite of typical pattern; suggests may be related to interference of the E-W Uinta trend, expressed in South Mtn (T&R, 1971; Crittenden, 1976).

**Tooele arch** (Ordovician) evidence includes unconformity in Ord rocks in Stansbury Mtns and Island, Lakeside Mtns. Hintze paper on evidence. Extends toward SLC.

**Stansbury uplift** (Devonian) evidence includes unconformity in N Stansbury Mtns and presence of Stansbury Fm conglomerate and sandstone. Unconformity also appears to be faulted/sheared (Foose, USGS map). Rigby paper on evidence. Enigmatic and localized feature.

✓ **Sevier fold-thrust belt** (Late Cretaceous to Eocene). Tooele 30x60 straddles the boundary between the Wyoming salient and Provo (CN) salient of Sevier fold-thrust belt (also see Coogan and Constenius, AAPG, 2003). The dividing line is considered the Uinta-Cottonwood arch (Kwon and Mitra, 2004; Presnell, 1997; others in Kwon and Mitra, 2004; Yonkee and Weil, 2011). Previously Lawton and others, 1994 (see Makul and Mitra, 1998) called the dividing line the Salt Lake transverse zone.

✓ **Northern Utah highland** is discussed by Eardley (1939); now called the Wasatch anticlinorium (Yonkee) or Wasatch culmination (DeCelles). Astroblème hypothesis by Cohenour (1987) and Fox (recent emails to Willis) for this same structure, but sparse evidence.

✓ **Unnamed Transverse zone** (Ordovician?, Devonian?, Cretaceous, Cenozoic) discussed by Young (1953) and Mabey and others (1963 USGS PP). The fault zone is shown in both of these references. Mabey (2002 review of Tooker unpub paper Oquirrh mtns) says large gravity gradient in N part of Oquirrh Mtns; one of largest gravity anomalies over bedrock in NW Utah, and appears to be related to major structural features in Tooele and Salt Lake Valleys.

Salt Lake transverse zone indicated by Lawton and others, 1994; Bruhn et al, 1986 (AAPG Memoir 41)??

Rowley (1998, p. 209) discussed this east-striking transverse zone, suggesting the existence of the Salt Lake salient and other evidence. It could be extended west 100 km, but is poorly constrained and so is not shown on his figures.

Cashman (1992) stated there is no evidence for a fundamental structural boundary between the N Stans Mtns and Stansbury Island, but noted that the Little Baldy syncline is in line with the Stansbury anticline, possibly suggesting some minor lateral offset. If there are no major structures between Stans Island and Stans Mtns, dramatic lateral compositional variation within the Stansbury Fm is required (see Trexler).

Clark (this study) looked at bedrock drill hole data to partly constrain at N end of Oquirrhs (see cross section C-C').

To the west, the transverse zone may merge with the Lakeside fault (LF has a complex history per Young 1953) and the Lakeside fault may merge with Miller's accommodation zone in Newf 30x60 (near Hogup Gap). Young indicates incorrect sense of movement on his map (see Palmer,

1970). There may be 3 to 4 miles of right lateral movement based on possible Stansbury Island and Mtns offset, and offset of Oquirrh from Miss at S end of Lakesides. Where does the transverse zone go E from the Oquirrh? Does it splay, or head toward the Mt Raymond thrust?(N side of Cottonwood arch). Paulsen and Marshak papers (1997, 1998, 1999) talk about Mt. Raymond, Charleston transverse zones. Does not appear to be a good connection due E to the Ft. Douglas quad (Zach, verbal). Yonkee (verbal comm, Dec 2016) noted that the transverse zone contains Oquirrh rocks on the south but not to the north, so this could be the edge of Oquirrh subbasin. Leamington transverse zone thought to be south edge of Oquirrh basin (Mitra ref; Kwon and Mitra, 2004). Skull Valley and Lakeside Valley grabens look to be offset.

✓ **Sevier thrust faults** in Tooele include Daddy Stump Ridge backthrust, Willard, Ogden, Black Rock, North Oquirrh, Midas, Stansbury, Broad Canyon backthrust, Skull Valley, Cedar, South Hastings-Puddle Valley?, E Cedar backthrust complex, Skunk Ridge?, Calcite. Unclear if thrust exists between Lakesides and Stansbury Island. Lakeside Mtns block could be a backthrust? We now have timing on the Cedar thrust from DZ. Willard and Stansbury thrusts demark line between western and eastern thrust systems.

✓ **Lateral ramp of the Willard thrust** sheet may extend NW from N Stansbury Island (or between Stans and Carrington Islands) and could merge with Miller's accommodation zone near Strongs Knob. Carrington and N Stans Island have Neoproterozoic rocks suggesting the hanging wall of Willard. Other evidence is series of NW trending tear faults in Stans Island, greatly tears up Cambrian section so difficult to tell what nomenclature. Adolph didn't like this idea (Dec 2016 meeting), he would rather run the Willard thrust south to the SL transverse zone (Yonkee and Willis, UGA pub). However, S Stansbury Island and Lakesides don't seem to fit with the Willard thrust sheet. Mohapatra (JGR) puts the Willard close to Carrington Island (in Amoco well H) and south along the E side of Stansbury Island; this is based on a TD interp in Tintic in that well. Yonkee thinks that well interpretation is questionable. Bortz says the Carrington well TDs in Precambrian in the palynology figure, the well summary table says Pliocene, likely an error.

✓ **Lateral ramp at N end of Oquirrh Mtns** suggested by mapping and cross section construction

(T&R, Clark) (comment by D. Miller).

## Major Folds

Oquirrh Mtns – Mills Junction syncline, Kessler anticline, Coon Peak syncline, Chaos zone, Coon Canyon folded block, Copperton anticline, Copperton overturn, Bingham syncline, Apex fold

Stansbury Island – Stansbury anticline,

Stansbury mtns – Deseret anticline, Timpie Valley syncline, Timpie Ridge anticline

Cedar Mtns – Cedar anticline, Low syncline

Lakeside Mtns – Black Mtn syncline, Oquirrh fold complex

Skunk Ridge - folds

✓ **Manning Canyon decollement** (Sevier and post-Sevier) includes evidence of differential folding above and below. More tightly folded above, more gently folded below. [ Present in Broad Canyon backthrust plate, Lakeside Mtns. ]

**Strange or complicated structures** (age?) include S verging thrusts in N Oquirrh, [ the Garfield fault (large throw on N trending fault and different fold trends), could this be similar to the SL salient block? ] [ Also chaos zone in Oquirrh (unit Pdk) between N Oquirrh and Midas thrusts. ]

[ Also Lakeside fault. Some may involve multiple episodes of deformation ]

✓ **Post-Sevier relaxation** (Eocene to Oligocene) includes younger on older faults in Oquirrh (between N Oquirrh and Midas thrusts), maybe Broad Canyon fault, maybe MC decollement, maybe Lakeside fault?

**Tertiary half grabens** (Paleocene, Eocene, Oligocene, Miocene, Pliocene?) including Hastings Pass-Cedar Mtns (Tso), W Stansbury Mtns (Tsl), E Stansbury Mtns low area along Broad Canyon fault (Tso, Tvs, Tsl), Harkers Canyon-E side of Oquirrh (Tsl), SE side of Antelope Island (Tw?, Tnf, Tsl).

✓ **Normal fault zones** (Quaternary) include West Valley, Oquirrh, Great Salt Lake (and Carrington fault), Stansbury, Puddle Valley. There is a new Q fault on the west side of the Cedar Mtns.

**Other valley faults and grabens** (Miocene-Quaternary) are mapped from geophysical data (mostly gravity, some seismic) and include W Salt Lake Valley, SE side of Antelope Island, Great Salt Lake, N Tooele Valley, Lakeside Valley, Skull Valley.