U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

NUCLEAR WASTE TECHNICAL REVIEW BOARD
PANEL ON STRUCTURAL GEOLOGY & GEOENGINEERING

SUBJECT: SUMMARY OF LATHROP WELLS STUDIES: PROGRESS AND FUTURE DIRECTION

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ALEXIS PARK HOTEL
SEPTEMBER 14 - 16, 1992
Lathrop Wells Center
Summation of Studies

Presented series of overview talks

• Individual investigators
• New data, new interpretations
• Not done but progressing (pleased, even excited about results)
• Resolve differences with data
  it is working . . . . .
Continued difficulties with K-Ar and $^{40}\text{Ar}/^{39}\text{Ar}$ data

- **Problem:** data interpretations, not analyses or methods
  - Data range: too large for analytical error
  - Non-gaussian distribution
  - Positively skewed
  - Influential cases in regression calculations
  - Selective removal of samples
  - Improper use of weighted mean
  - Excess Ar

- **Future directions:**
  - Upper Bound age of center (>150 ka)
  - QA data set
  - $^{40}\text{Ar}/^{39}\text{Ar}$ ages of lithic fragments
  - More careful definition of assumptions, uncertainty data
  - Mineral separations
$^{40}\text{Ar}/^{39}\text{Ar}$ Ages of the Bandelier Tuff Lower Member
Spell et al. (1990)

Normal Probability Plot (SYSTAT Version 5.0)
$^{40}\text{Ar}/^{39}\text{Ar}$ Ages of the Bandelier Tuff Upper Member
Spell et al. (1990)

Normal Probability Plot (SYSTAT Version 5.0)
$^{40}\text{Ar}/^{39}\text{Ar}$ Ages: Lathrop Wells Center
Turrin et al. (1991)

Normal Probability Plot (SYSTAT Version 5.0)
### Comparison of Variance Weighted Data Sets

40^Ar/39^Ar Method

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<tbody>
<tr>
<td>Number of Cases</td>
<td>40</td>
<td>36</td>
<td>26</td>
<td>26</td>
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<tr>
<td>Minimum</td>
<td>-20</td>
<td>-20</td>
<td>1.08</td>
<td>1.4</td>
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<td>Maximum</td>
<td>947</td>
<td>392</td>
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<td>Mean</td>
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<td>Median</td>
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<td>149</td>
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<td>Variance</td>
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<td>Standard Deviation</td>
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<td>Skewness (G1)</td>
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<td>0.5</td>
<td>-0.5</td>
<td>-.31</td>
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<tr>
<td></td>
<td>ka</td>
<td>ka</td>
<td>Ma</td>
<td>Ma</td>
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</tbody>
</table>
Lathrop Wells Center
Summation of Studies

U-Th disequilibrium

- Problems:
  - Analytical problems overcome
  - Mineral separations
  - Expensive, time-consuming measurements

- Future directions:
  - Decision on utility of method -- next few months
Cosmogenic He age determinations

- Problems:
  - Minimum ages
  - Calibration of production rate
  - Age of main cone

- Future directions:
  - Technique looks promising
  - QA hurdles overcome
  - 65 ka convergence?
    He, $^{36}\text{Cl}$, K-Ar mineral separations

Resolution = More data

Calibration Sites
Lathrop Wells Center
Summation of Studies
(Continued)

Thermoluminescence

- Experiment Snake River Plains: good results < 30 ka
- Reproducible numbers
- Problems:
  - Calibration > 30 ka
  - Inconsistent with $^3$He (Forman not satisfied with sample)
  - Coarse sand

- Future directions:
  - Experiments to test applications of method
  - Understand mechanisms of young ages
  - Calibration sites for comparison
Significance of Lathrop Wells Studies
Are the Different Interpretations Important?

Eruption models: monogenetic versus polycyclic

- Both models require multiple events
- Repository perspective:
  - Semantic versus substance
  - Multiple pulses

**Key => Polycyclic model factored into E3**

- Sufficient merit to polycyclic model to continue testing
  - Paleomagnetic data is inconclusive
  - Must examine all models, particularly conservative models
  - Timing of multiple events still unknown
Summary of Lathrop Wells Studies
(We are Getting There)

• Encouraged by progress
  - Somewhat slow but steady
  - End is in sight; particularly with access to quarry property
  - Analogous features at other volcanic centers
Summary of Lathrop Wells Studies
(We are Getting There)
(Continued)

• Investigators must be objective about results
  - Point out strengths and weaknesses of methods
  - Separate constraints, assumptions, speculations
  - Propose, test, revise...(repeat)

• Plea for professional objectivity
  - Maintain perspective of risk impact
  - Obtain fully qualified data
  - Be prepared to accept bounds versus resolution
  - Differences of opinion are healthy
    * Alternative models important for the YMP
  - Differences can be established without polarization
FY 93 Priorities

- Geochronology studies
  - Continue (possibly wrap-up) Lathrop Wells studies
  - Detailed studies
    -- Sleeping Butte
    -- Crater Flat

- Field studies
  - Crater Flat mapping
  - Volume calculations
  - Pliocene Centers

- Probability studies
  - Issue resolution: major emphasis
  - E1-E2 tables

- Effects
  - Field analogues
  - E3 constraints

- Review of Geophysical data