Yesterday, Barb and I returned after 60 days on the road and many wonderful experiences. In terms of science at the end of this report I will reproduce the three summaries of research and plans discussed with each colleague. However, first, in terms of travel experience, I’ll put up a last bunch of pictures from Athens, Rome, London (for a day at the end of the trip), and Florida.
In the restaurant in the Acropolis Museum, note the Parthenon behind us.

From Athens we went to Rome:
Above and next pages: The great coliseum in Rome,
The Arch of Titus showing the spoils from the Temple in Jerusalem
Below: Outside our hotel in Rome

Next page: In the Map Room in the Vatican
Above: In the Vatican by Raphael, Below: La Pieta by Michelangelo
Below: Outside St. Peter’s Basilica in Vatican City

Below: Inside St. Peter’s
The following pictures are from the Jewish Ghetto area of Rome starting with the Great Synagogue of Rome
On the river Tiber with the Great Synagogue behind Barb

Then it was off to London for a day before the flight back to the US
Below: Piccadilly Circus
Below: Trafalgar Square

Had supper in Chinatown (next page):
We saw two plays that last day including Wicked.
Then we went back to Florida. We did a number of things including seeing the NY Mets defeat the Atlanta Braves 7-5 in a spring training game Port St. Lucie. Thanks nephew Michael Berman for the tickets. Michael works for the Mets.

Back to the science

From Alex Hannon at the Rutherford Appleton Lab near Oxford:

**Overview of Steve’s Sabbatical Visit to ISIS, January 2016**

- Bismuth silicates. Follow-on study from bismuth germanates. Formation, properties, NMR, Raman and ND. For ND proposal, justification includes papers on Bi$^{5+}$/Bi$^{3+}$ in Bi silicates.
- Bismuth germanates. ACH must send samples to Blane Baker at William Jewell. ACH contact Gavin Mountjoy about XANES results.
- Barium tellurites. Samples now received from Brittney Hauke. More GEM data will be collected in February 2016. ND data need to be corrected.
• Lithium silicates. Initial data corrections have been done, but coordination numbers are not satisfactory – attempts to improve the data corrections and analysis are needed.

• Crystalline Li$_2$O intended to be run on GEM in February 2016, to further investigate Li-O first peak, and the magnitude of its thermal broadening (unusually high amplitude, we think). Also investigate whether data on Li$_2$O shed light on the unusually narrow/intense second diffraction peak for Li silicate glasses, and its corresponding long distance correlation. (Is lithium orthosilicate (2Li$_2$O.SiO$_2$) possible to run on GEM, and to use for simulation?)

• Alkali glass formation overview paper – based on talk given at Nottingham.

• CO$_2$ in glass. Aim – what is structural role of CO$_2$? ND experiment – lithium borosilicates may be the best system. Lithium silicate above orthosilicate is another possibility. CO$_2$ retention starts at J=2. See PCH 1991 paper (Zhang) for CO$_2$ retention in Li borosilicate. Na silicate is more hygroscopic than Li silicate, but Na silicate is more CO$_2$ retaining.

• GOMD/Madison – find out status of our abstracts.

• Sb$_2$O$_3$ – need a sample for XRD.

• Width of $T_g$ DSC peak ($\Delta T_g$) in experimental data for low alkali tellurites – is it anomalous as for borates?

From Hubert Huppertz (University of Innsbruck, Austria) rough notes of our chats:
$J = \frac{x}{1-x}$

End of Glass Formation

$J = 3$ for most alkalies

1. Trigonal 2 B-C
2. Trigonal 3 B-C
3. Tetrahedral

For $B_{eq} = (-)$

$T_{12} - C \text{ or } B_{eq}$

$T_{3} \text{ and } B_{eq}$
$J = 3$

$Li$: $\text{Li}_2\text{CO}_3$ or $\text{Li}_2\text{O}$

$Na$: $\text{Na}_2\text{CO}_3$ or $\text{Na}_2\text{O}$

$H_3\text{BO}_3$ or $B_2\text{O}_3$

$J \geq 2$ (end)

$k, \text{Rb, Cs}$ (end) $1 \leq J \leq 2$ (end)

$\text{Rb}_2\text{O}$

$\text{RbOH} + H_3\text{BO}_3$

$\text{Cs}_2\text{O}$

$\text{CsOH}$

$\text{CO}_4$

$\text{Li}_2\text{CO}_3$

$\text{Li}_2\text{O}$
1. N₄ measurement
   Li₂O 3BO₃ 2H₂O \text{ total } N₄ = 96

2. Polymorphism
   T₅ = ?

Talk 2 10B NMR of Ring

N₄': Na₂B₄O₇
   N₄ = \frac{1}{2}

K
   kBO₅

edge sharing
   k₂B₂O₅

Rb₂B₃O₅

H₂O
   N₄ = 2 \text{ exp}
   N₄ = 2 \text{ prod}

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Paper to me.

$\text{Ba}_{14} \text{Na}_2 \text{Zn}_1 \left( \text{B}_8 \text{O}_{12} \right) \left( \text{B}_{12} \text{O}_{24} \right)$

$\text{OB}_4 \text{Gd}_0.5 \text{Dy}_0.5$  

$\left( \text{B}_8 \right)$

$\overline{\text{C}_6 \text{B}_8 \text{O}_5 - \text{Na}}$

$\text{C}_5 \left( \text{H}_2 \text{O} \right) \text{Cl}_4 \text{B}_8 \text{O}_5 \text{HP}$

$\text{HP} - \text{T}_{2} \text{B}_8 \text{O}_5 \text{HP}$

$\text{HP} - \text{C}_5 \text{B}_8 \text{O}_5$

$\text{A}_{5} \quad 2\text{A}_{5} \text{B}_3 \text{O}_5 \quad 36\text{PA}$

$2\text{A}_{5} \text{B}_3 \text{O}_9$

$\text{Rb}_6$ ? della forma
Measurements under pressure?

$Cs_2O \cdot B_2O_3$

$s = 1$

TIAA-CREF

CsBO$_2$ 1994

The program "Papers"

$Na BO_2$
$K BO_2$
$Rb BO_2$

$N_4 = 0$

$Cs_2BO_3$
Innsbruck 11 Feb 2016

Reactive program:

\[
\begin{align*}
S & \rightarrow \text{B-O} \rightarrow \text{O} \\
S & \rightarrow \text{B-O} \rightarrow \text{O}
\end{align*}
\]

Send glasses:

1. Project: Li_3BO_3, K_2BO_3, C_8BO_3
2. 6 grains from HP Crystals
3. Schott? NMR of HP Crystals

(2) K. B_3O_5 \xrightarrow{\text{rapid \_{100}}^\circ} \text{glass}
Ask about starting materials.

Clothing of Alkali - Sand Papers

Students
Summary of Discussions with Stratos and Steve, February 26, 2016

Collaborative work

1. Cesium orthoborate and metaborate glass to Stratos and Hubert (to make crystalline solid)
2. Li-Na and Li-Rb glasses of high alkali content to Stratos, even above orthoborate composition Ref 50 of Stratos publications
3. Email to Hubert clustering papers
4. Check Fulbright for international awards
   http://exchanges.state.gov/non-us/program/fulbright-visiting-scholar-program
   http://exchanges.state.gov/non-us/program/fulbright-foreign-student-program
5. Neutron scattering of Zn-Te glasses
   Simulation of TeO2 and Zn-Te glass neutron scattering data (from Alex)
6. Send low J alkali borate samples, near J = 0.05 Na and Cs
7. CO2 retention Li-B-Si glasses (J greater than 3 + 2J2) or Na borate glasses (past 65 molar percent Na2O): Tg as a function of Temperature and Time
8. Lithium silicate glasses, cage like T(r), Raman and IR for samples up to 65 molar percent lithium oxide. check neutron scattering compositions

What a trip! I thank Coe for allowing me this chance to plan research for many years to come. Barb and I had a great trip.

Steve Feller