Nuclear data uncertainties limit precision and accuracy of predictive application simulations – or finding the leaks in the covariance pipeline.
Differential experimental data covariance needs:

- Vetted EXFOR for evaluations and testing if evaluated uncertainties are realistic → supplemented by templates
- When designing experiments its impact on applications must be tested → involves evaluators and uncertainty propagation to applications.
- Uncertainties must be reported for each funded measurement → enforced through funding, journals, templates and EXFOR.
Evaluated covariance needs:

- Establish covariance high-priority list
- Complete covariance libraries → community prefers low-fidelity covariances instead of 0
- General-purpose library for adjustment and tools for adjusting
- FPY, TSL, angular distribution covariances
- Mid-fidelity covariance evaluations for missing covariances?

<table>
<thead>
<tr>
<th>Nucleus</th>
<th>Summation Yield</th>
<th>Sum. ΔYield</th>
<th>Sum. ΔYield No Corrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$^{235}\text{U}$</td>
<td>6.37</td>
<td>2.58%</td>
<td>1.76%</td>
</tr>
<tr>
<td>$^{238}\text{U}$</td>
<td>9.69</td>
<td>2.51%</td>
<td>2.04%</td>
</tr>
<tr>
<td>$^{239}\text{Pu}$</td>
<td>4.39</td>
<td>3.19%</td>
<td>2.08%</td>
</tr>
<tr>
<td>$^{241}\text{Pu}$</td>
<td>6.25</td>
<td>3.27%</td>
<td>2.36%</td>
</tr>
</tbody>
</table>

T. Bailey

A. Sonzogni
Documentation/ quality assurance needs:

- Covariance verification and validation must be done before the release of the library, automatic testing tools needed

- Document quality of covariances across libraries and recommendations how to merge libraries for complete libraries

- Assess quality of only theory-supported nuclear data

- Covariance high-priority list including feedback from applications what is important.

- Document nuclear data tweaks and validation experiments used during library validation.
Working group (industry, various DOE applications, nuclear data experts) needed to understand:

- Covariances needs
- General nuclear data problems of users
- Which integral experimental responses are best used for nuclear data validation to make our libraries more applicable for their application area
- Which sensitivity tools are missing
- Should foster better communication with industry regarding their needs and how to use covariances
Tools needed:

- Sensitivity tools to propagate uncertainties of nuclear data to various application

- Automated testing if covariances are realistic with differential/ integral data & verification

- Generating missing covariances

- General-purpose adjustment beyond criticality simulations

- Tools (and formats) for processing FPY, TSL, angular distributions, multi-group?
Validation experiments needed:

- Non-traditional validation experiments applicable for several applications areas (give uncertainties!)

- Vet existing integral experimental data suites to go beyond criticality

- Engage with application community to obtain existing validation experiments

- Temperature-dependent validation measurements