
BEYOND THE BOX DIGITIZATION COMPETITION

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OVERVIEW

The Beyond the Box Digitization Competition will award up to \$1 million to the person or team who creates an automated technology that increases the speed and accuracy of digitization of a drawer of insect specimens and their associated data.

The Competition is a joint effort of the U.S. National Science Foundation (NSF) and the American Institute of Biological Sciences (AIBS), with NSF serving as the Sponsor and AIBS serving as the Organizer.

Entrants will use a standardized drawer of insect surrogates (referred to as “specimens” within this document) and related surrogate objects, pinned in multiple unit trays with labels stacked and arranged in several “typical” and challenging configurations. The drawer’s specimens must be imaged with no human intervention, and label data must be automatically captured and translated into digital format using automated methods such as optical character recognition (OCR) and natural language processing (NLP). The Competition encompasses visualization of obscured objects, digitization of labels, digitization of specimens, and OCR. Data dictionaries may be utilized to assist the OCR translation. The solution may tap into existing natural history collections data dictionaries, create comprehensive new data dictionaries, or leverage a combination of the two resources.

Prize Parameters

- The positions of specimens, unit trays, labels, and other elements in the Entrant’s drawer must be those outlined in the specifications for the surrogate drawer. The only allowed human intervention is the placement of the entire specimen drawer in the imaging station developed by the Entrant. Human manipulation of the positions of specimens, labels, unit trays, or any other elements within the drawer is not permitted once the specimen drawer has been placed in the imaging station.
- Once the specimen drawer has been placed in the imaging station, direct contact with the specimens is not permitted, either via human intervention or the technology. The position of the specimen on the pin may not be manipulated in any way.
- Specimens must not be damaged in any way.
- Labels must not be damaged in any way.
- If a pin is removed from its original location by mechanical means, it must be returned to the precise original location and position.

All submissions will be evaluated by a panel of judges based on whether they have or have not met the specified Levels of Achievement (below) and their associated parameters, and will be scored based on the quality of meeting these parameters. Entrants must meet all Level 1 through Level 4 parameters to qualify as a finalist.

The number of judges evaluating each submission will be based on the number of submissions received. Finalists will be invited to an on-site demonstration and evaluation of their technology for 1) their original surrogate drawer and 2) an actual insect drawer with real specimens (provided to the finalists on-site).

If the selected winner fulfills all of the Level 4 Achievements (but not all of Levels 5 or 6), they will be awarded \$500,000 USD. If the selected winner fulfills all of the Level 5 Achievements (but not all of Level 6), they will be awarded \$750,000 USD. If the selected winner fulfills all of the Levels of Achievements set forth for the Competition, including all of the Level 6 parameters, they will be awarded \$1,000,000 USD. Only one winner will be selected.

ENTRANT ELIGIBILITY

Each Entrant (defined as either a team or individual) must have only one designated team leader. The team leader must be a U.S. Citizen or a legal Permanent Resident and must reside in one of the 50 States, Washington, D.C., or a U.S. Territory. Other than the team leader, team members are not required to be U.S. Citizens or to reside in the United States. Citizens of Burma (Myanmar), Cuba, Iran, Sudan, and Syria or persons or companies on the Specially Designated Nationals and Blocked Persons List maintained by the U.S. Treasury are not eligible to participate in any way in this Competition. There is no limit to the number of individuals on a team.

All entrants must be 13 years of age or older at the time of their submission. Entrants between 13 and 18 years of age will be required to demonstrate the consent of a parent or legal guardian at the time of submission.

Employees, board members, officers, and directors of the Sponsor (U.S. National Science Foundation [NSF]) and the Organizer (American Institute of Biological Sciences [AIBS]) directly involved with the development and/or administration of this Competition and members of their immediate family (parents, siblings, children, spouses, and life partners), as well as individuals living in the same household (whether related or not) are ineligible to submit an entry. Individuals who have provided guidance and consultation to the Sponsor and Organizer for this Competition, including Planning Committee members and any associated working group members, are ineligible to submit.

Entrants must have access to the Internet as of the Competition deadline. Entry and registrant information must be submitted in English. Participants must self-certify their eligibility as part of the online submission.

Entrants cannot include any Federal entity or Federal employee acting within the scope of their employment. This includes any U.S. Government organization or organization principally or substantially funded by the Federal Government, including Federally Funded Research and Development Centers, Government-owned, contractor operated (GOCO) facilities, and University Affiliated Research Centers.

An individual or entity shall not be deemed ineligible because the individual or entity used Federal facilities or consulted with Federal employees during the Competition if the facilities and employees are made available to all individuals and entities participating in the Competition on an equitable basis.

AIBS and NSF reserve the right to verify eligibility of any Entrants and winners, and reserve the right to disqualify Entrants at any time if, in NSF's and AIBS' determination, Entrants do not meet the Applicant Eligibility requirements.

Winning the prize Competition is contingent upon the Entrants fulfilling all of the requirements set forth in the Rules and Eligibility guidelines.

The Competition will open at 8:00 AM Eastern on December 05, 2014 and close at 11:59 PM Eastern on September 04, 2015.

ENTRANTS UNDER THE AGE OF 18

Entrants must be aged 13 years or older on the date of submission. Those under 18 years of age (minors) as of their submission date require parental or legal guardian consent to submit to the Competition. Submissions must be made through the official contest entry form. Any minors on a team must have their parents or legal guardian submit consent on the appropriate part of the submission Web site.

Children of employees of the NSF directly involved with the development and/or administration of the contest, Competition judges, consultants for the Competition, employees of AIBS directly involved with the development and/or administration of the contest, contest Sponsor institutions, or current AIBS board members are ineligible to enter.

Should a Minor Entrant make it to the final round, s/he must be accompanied by a parent, legal guardian, or a responsible individual over the age of 18 as designated by a parent or legal guardian.

In order for a Minor Entrant to accept the grand prize, parental or legal guardian consent must be given to the NSF and AIBS to use the name and likeness of the grand prize winner in contest-related communications.

JUDGE ELIGIBILITY

All entries that meet the Competition eligibility requirements will be evaluated by a panel of judges. Competition judges will be subject matter experts best suited to evaluate the technologies submitted.

Per 15 USC Sec. 3719 - Prize Competitions, judges may not have personal or financial interests in, or be an employee, an officer, a director, or an agent of any entity that is a registered participant in the prize competition. Judges may not have a familial or financial relationship with an individual who is a registered participant. Judges may 1) be required to abide by a code of conduct or judging agreement; and 2) be required to provide financial disclosures as are relevant to avoiding conflicts of interest. Judges may not have personal or financial interests in, or be an employee, an officer, a director, an agent, or a member of a board of the Sponsor (U.S. National Science Foundation) or Organizer (American Institute of Biological Sciences). Judges will be required to sign a nondisclosure agreement and a code of conduct form.

Judges will be required to create a personal login with a video sharing site to access and view submission videos. This will require appropriate and professional online behavior.

LEVELS OF ACHIEVEMENT

** All captured images must be in an uncompressed, lossless format with a minimum resolution of 5760 x 3840 pixels.

1st Level of Achievement (Specimen Imaging):

- 1.1 A single dorsal image of each specimen is captured with a minimum resolution of 5760 x 3840 pixels. The entire dorsal surface of the specimen is visible in the image and is in sharp focus. The image is not obscured by other specimens or objects other than the pin.
- 1.2 A single lateral image of each specimen is captured with a minimum resolution of 5760 x 3840 pixels. The entire lateral surface of the specimen is visible in the image and is in sharp focus. The image is not obscured by other specimens or objects.
- 1.3 A single lateral image of each specimen and the arrangement of any labels and capsules that are attached to the pin and/or associated with the specimen is captured with a minimum resolution of 5760 x 3840 pixels.
- 1.4 All captured specimen images must be traceable to ensure proper identification of images from the same specimen.
- 1.5 The system is able to successfully navigate overlapping specimens (Tray 4, specimens 3 and 5 will serve as the example), such as with a warning system indicating that human intervention may be needed at a later date, software that is able to recognize and digitally correct overlapping sections, or otherwise address the issue of overlapping specimens.

The Entrant's system may capture more than the above, required images. However, all the above images are required to satisfy the level of achievement.

2nd Level of Achievement (Enhanced Specimen Imaging):

- 2.1 All "1st Level of Achievement" criteria are met.
- 2.2 Each specimen image contains a small color reference chart (e.g., Calibr8 Digital Color Chart SG - Extra Small 2.4" x 1.6")
- 2.3 Each specimen image contains an algorithmically-generated or physical size reference scale.
- 2.4 For all specimens, the resolution must be sufficient to produce a sharp image at 10x magnification when viewed on a screen.
- 2.5 Each specimen image must contain minimal white space. No more than 25% of the image may contain white space, including the frame space filled by the specimen, the color reference chart and the reference scale.

3rd Level of Achievement (Label Imaging):

- 3.1 All "2nd Level of Achievement" criteria are met.

- 3.2 The size reference scale is generated or selected dynamically to ensure that it is no larger than 2x the specimen's longest dimension. Units are in centimeters and millimeters.
- 3.3 All labels affixed to the pin are captured. The data on the final image to be used for optical character recognition (OCR) are not obscured. Label capture includes the ability to fully capture images of labels that are touching, upside-down, or double-sided.
- 3.4 Each label image should meet the minimum sufficient resolution for OCR. The "x"-height of a captured label image is the height of a lower case "x" within the label. An "x"-height greater than or equal to 20 pixels is required.
- 3.5 All captured label and specimen images must be traceable to ensure proper identification of label and specimen images that are from the same specimen.

4th Level of Achievement (Label OCR Capture):

- 4.1 All "3rd Level of Achievement" criteria are met.
- 4.2 OCR will be executed on all captured label data for each specimen.
- 4.3 Each specimen's data will be inserted as a single record into a database of any type. Raw text generated by OCR will be inserted into text fields associated with the specimen, with a separate field for each label captured during the imaging process. For purposes of this Competition, the database must be hosted online, for ease of access for all of the judges.
- 4.4 Specimen and label image files will also be stored in the database with each specimen record.
- 4.5 Ancillary captured data from the unit tray, such as images of unit tray labels not associated with a particular specimen (frequently the genus and/or species of the specimens in the tray) will be imaged, processed through OCR, and inserted into the database and for each specimen within that unit tray.
- 4.6 Type-written labels written in English must be translated in the database with an accuracy of 90%.
- 4.7 A specimen with labels containing any hand-written elements that are not recognized by OCR must be flagged for later human intervention within that specimen's record in the database.

5th Level of Achievement (OCR Data Parsing and Natural Language Processing):

- 5.1 All "4th Level of Achievement" criteria are met.
- 5.2 Specimen data obtained through OCR will be inserted into the database after being parsed into appropriate fields (rather than as a single text field). Fields will correspond to the Darwin Core schema (reference <http://rs.tdwg.org/dwc/terms/#theterms>). The minimum Darwin Core field set is listed below (elements may be left blank if they are not present on the specimen label):
 - scientificName
 - genus

- specificEpithet
 - recordedBy: Collector name(s) (people, groups, or organizations)
 - verbatimEventDate: Date specimen was collected from the field
 - verbatimLocality: Location information (typically includes distance and direction from a town, the county, the state, and the country if outside the United States)
 - verbatimLatitude
 - verbatimLongitude
 - catalogNumber: Bar code number or identification id for the specimen
 - institutionCode: Institution name or code where the specimen is held
 - collectionCode: Collection name or code to which the specimen belongs.
- 5.3 Data elements present on the label(s) other than those identified above must be parsed and stored in a single text field within the database to denote that human intervention is required.
- 5.4 A minimum of 60% of parsed data (60% accuracy over all of the data for a drawer) will be accurately assigned to the appropriate Darwin Core field.
- 5.5 A maximum of three minutes is encouraged for the digitization of each specimen and associated labels and capsules. Translation of label data into database elements via OCR, data parsing, and natural language processing may occur automatically during post-processing without any time limitation, except that it must be completed prior to submission and, if selected as a finalist, must be completed in time to be evaluated in both the Phase 1 and Phase 2 on-site demonstrations.
- 5.6 Metadata associated with the digitization process are captured in the database and include the following:
- A drawer identifier
 - A timestamp showing when the data capture process began
 - A timestamp showing when the data capture process was completed (when the drawer can be safely removed)
 - A specimen counter indicating how many records are in the database for this drawer
 - An operator identifier indicating who was overseeing the digitization technology

6th Level of Achievement (Data Presentation):

- 6.1 All “5th Level of Achievement” criteria are met.
- 6.2 All specimen, label and ancillary images are presented via a Web interface on a single Web page.
- 6.3 Raw text generated by OCR is also presented on the page, with data parsed into the appropriate Darwin Core fields.

- 6.4 Edit capabilities to enable expert correction of raw text generated by OCR will be provided for each data field.
- 6.5 Drag-and-drop capabilities will be provided to enable text to be dragged into the appropriate Darwin Core field by an expert reviewer.

SURROGATE DRAWER SPECIFICATIONS

To ensure a common basis for all Entrants, drawers, unit trays, and pins (as well as any other entomological equipment necessary) must meet the specifications below as well as those provided in the associated appendices. Some examples of how to obtain the equipment include borrowing or partnering with a university, natural history museum, or natural science collection; building the drawer and unit trays based on the specifications below and in the appendices; or purchasing the appropriate materials. Some, but not all, vendors include:

BioQuip - <https://www.bioquip.com/>

Carolina - <http://www.carolina.com/>

Forestry Suppliers - <http://www.forestry-suppliers.com/>

HH Elements - <http://www.hhelementsinc.com>

Ward's Science - <https://www.wardsci.com/>

Refer to Appendices A – I (Drawer, Unit Tray, and Content Specifications) for comprehensive measurements and required information related to the drawer, unit tray, specimens, and labels.

There must be no overlap of specimen wings (shingling) EXCEPT in Tray 4 between specimens 3 and 5. Any other overlap between specimens (limbs, antennae, etc) should be very minimal to non-existent. The system must be able to handle any overlapping specimens within the tray (for example, warning system for human intervention later, movement of box, etc). Per the Competition guidelines, there can be no human intervention after placement of the entire specimen drawer in the imaging station developed by the Entrant.

- a. All measurements are provided in inches.
- b. Measurements may be rounded to the nearest 1/16th of an inch as necessary
- c. Unit Tray Inserts (Crosshair Pages)
 - i. Must be printed at 100% scale, using 36 lb white 100% cotton paper.
 - ii. The insert consists of the area within the grey and labeled bounding box and must be cut and placed within the tray to enable proper pin placement for each specimen.
 - iii. Use the second crosshair page, without the specimen labeling, as the tray insert.
- d. Labels
 - i. Labels must be printed at 100% scale, using 36 lb white 100% cotton

- paper.
 - ii. Labels must be printed in full color in the sRGB color space at a minimum of 300 dpi.
 - iii. Labels must be cut to the visible boundaries.
 - iv. In Trays 1, 6, and 7 the unit tray labels must be placed upright and held in place by two vertical pins.
- e. Drawer Specifications
- i. Purchase, borrow, or build a Cornell drawer with a hardboard bottom. The type of wood (for example, poplar, pine, etc.) that the box is constructed from does not matter.
- f. Unit Trays
- i. Unit trays are individual and removable from the drawer.
 - ii. Unit trays with the following dimensions must be used:
 1. Cornell unit tray with polyethylene foam pinning bottom, 4-3/8 x 7-5/16" – Quantity = 3; Trays 1, 2, and 5
 2. Cornell unit tray with polyethylene foam pinning bottom, 8-9/16 x 7-5/16" – Quantity = 2; Trays 3 and 4
 3. Cornell unit tray with polyethylene foam pinning bottom, 4-3/8 x 3-5/8" – Quantity = 1; Tray 8
 4. Cornell unit tray with polyethylene foam pinning bottom, 4-3/8 x 1-13/16" – Quantity = 1; Tray 7
 5. Cornell unit tray with polyethylene foam pinning bottom, 4-3/8 x 1-1/8" – Quantity = 1; Tray 6
 - iii. Unit trays specifications are contained within Appendices B through I. Trays are numbered and placed first left to right, and then top to bottom.
 - iv. Each unit tray contains a foam base into which the specimen pin is inserted. The unit tray insert will be placed on top of the foam base for each tray to ensure accurate placement of each pin.
 - v. "x" and "y" measurements are provided for the exterior dimensions of each unit tray.
 - vi. "z" measurements are provided for the interior dimensions of each unit tray; the "z" measurement indicates the interior distance from the top lip of the unit tray to the cardboard bottom, and the "internal" measurement indicates the distance from the surface of the foam base to the top lip of the unit tray.
 - vii. In order to reduce any significant movement of trays within the drawer, a spacer will be required in front of Tray 6. A suggested material for the spacer is wood.
 - viii. Trays 6 and 7 have no dimensions for the specimens. They should be very small, with sizes ranging from roughly 1 to 2 mm.
- g. Specimen pins must be #2 insect pins.

- h. Specimen Dimensions
 - i. Specimen dimensions are provided for each surrogate specimen on each pin within each tray. Specimens must measure within $\pm 10\%$ of the indicated values in order to ensure realistic obscuring of the underlying labels.
 - ii. Specimen “x” coordinates refer to the left-to-right dimension of the specimen, when viewed from above.
 - iii. Specimen “y” coordinates refer to the top-to-bottom dimension of the specimen, when viewed from above.
 - iv. Specimen “z” coordinates refer to the depth dimension of the specimen (i.e., the measurement from dorsal to ventral surfaces).
 - v. The specimens may be built from any material, but some example materials are as follows:
 - 1. Plastic tubing $\frac{1}{4}$ inch, $\frac{3}{8}$ inch, and $\frac{1}{2}$ inch outer dimension
 - 2. 30-gauge cloth wire
 - 3. Card stock 0.01 inch thick, various colors
 - 4. Foam sheets 0.063 inch thick, various colors
 - 5. Chenille stems (pipe cleaners) $\frac{1}{4}$ inch diameter, black
- i. Capsules
 - i. Trays 2 and 5 require capsules.
 - ii. The capsules must be standard “00” gelatin capsules.
 - iii. The capsules do not require any contents.
- j. Label and Specimen Placement on the Pin
 - i. Measurements provided indicate the distance from the point (sharp end) of the pin to the bottom of the object described. For example:
 - 1. Label 1 Position 0.45 inch indicates that the bottom of the label is 0.45 inch from the point of the pin.
 - 2. Specimen Position 0.7 inch indicates that the ventral surface of the specimen is 0.7 inch from the point of the pin.
 - 3. Note that some labels must be touching, or nearly touching, as reflected by the measurements. These scenarios represent real-world situations that must be overcome within the context of the Competition.
 - ii. A pinning block may be helpful for this process.
 - iii. In Tray 2, the first label for each specimen (label closest to the point of the pin) must be flush with the top of the foam of the tray.

- iv. In Tray 6, all of the labels must be flush with each other (touching).
- k. Pin Placement within the Unit Tray
 - i. After constructing the drawer and unit trays, cut out the unit tray inserts and place them at the bottom of each unit tray. Use the second crosshair page, without specimen labels, as the insert.
 - ii. Create specimen surrogates and cut out specimen labels, and place them on the pins per specifications.
 - iii. Place each pin within the designated unit tray at the location indicated by the crosshairs on the unit tray insert.

SUBMISSION MATERIALS

All Entrants must submit the following materials via the submission Web site:

1. A video demonstrating the process of scanning the entire surrogate drawer and all of its specimens and related labels and capsules. The video must be split screen, with the left-hand side of the video showing the technology/device in operation, while the right-hand side of the video must show the digitization of each specimen and associated labels and capsules in real-time. Videos should be a minimum resolution of 720p. The video will be uploaded as a private video to YouTube (via the submission Web site), and once submitted, the Entrant will not be able to view the video on YouTube.

Uploaded videos must be in a format indicated as acceptable by YouTube:

<https://support.google.com/youtube/troubleshooter/2888402?hl=en>

2. Three images each of one specimen from each of the trays, as described in the Level 1 Achievement. The specimen selected from each tray is up to the Entrant, except for the Tray 4 specimen, which must be either specimen 3 or 5.
 - a. One image must be the single dorsal image of the specimen.
 - b. One image must be the single lateral image of the specimen.
 - c. One image must be the single lateral view of the specimen plus any associated labels and capsules.

This equates to a total of 24 images (three specimen images X eight trays). The images submitted must be generated with **lossless compression**. The image file format submitted must be **non-proprietary**. The images, as indicated in the Levels of Achievement, must have a minimum resolution of 5760 x 3840 pixels.

The actual captured images from the device do not have to meet the above specifications of lossless compression. This specification is only provided for purposes of the submission aspect of the Competition. Captured images are required to be lossless, and should not be compressed.

Captured images: Those images captured directly by the digitization technology. These images must be captured by the technology in an uncompressed, lossless format with a minimum resolution of 5760 x 3840 pixels.

Submitted images: Those images submitted with an entry solely for the purpose of aiding in judging. These images must use lossless compression with a minimum resolution of 5760 x 3840 pixels and be submitted using a non-proprietary format.

3. Three images of the technology, with an element in each image that provides an indication of scale. Image files must not exceed 10 MB each. The image file format must be **non-proprietary**.
 - a. One image must be a side view of the device.
 - b. One image must be a top view of the device.
 - c. One image must be a front view of the device.
4. One image of the surrogate box, clearly showing each specimen. The image file must not exceed 10 MB. The image file format must be **non-proprietary**.
5. Log-in and access information for:
 - a. The database
 - b. The Web interface, assuming the Entrant believes their technology fulfills the 6th Level of Achievement

Use Appendix K, Form 1 to submit this information. This document (which will also contain the marketing plan referenced below) must be submitted as a PDF.

6. A 4-page (maximum length) marketing plan discussing and demonstrating how the technology would be made available (could be at cost) to collections to assist them in solving this national problem. Be sure to include associated costs with marketing the technology, as indicated below. The marketing plan will be evaluated based on the following:
 - The plan appears well thought out and appropriate/reasonable
 - The plan proposes potential methods for deploying the technology
 - The costs and estimates seem reasonable
 - The plan is comprehensive

The marketing plan must be submitted in a PDF format, using 12-point Arial font, with one-inch margins. Use Appendix K, Form 2 to submit this information. The marketing plan may contain images, tables, etc., as necessary but these must be included in the 4-page limit.

7. An export of the associated metadata information in an xls format. The file must include the following:
 - a. A drawer identifier
 - b. A timestamp showing when the data capture process began
 - c. A timestamp showing when the data capture process was completed, when the drawer can be safely removed
 - d. A specimen counter indicating how many records are in the database for this drawer
 - e. An operator identifier indicating who was running the machine

SCORING AND SCORING DEFINITIONS

There will be two phases to the judging process: online for all eligible submissions and on-site for the selected finalists. The number of judges that evaluate each submission will be dependent on the number of submissions received.

PHASE 1 – ONLINE

Submissions will be evaluated based on their required submission materials and whether they “Met” or have “Not Met” each Level of Achievement parameter (Phase 1a). Additionally, each parameter (except 2.1, 3.1, 4.1, 5.1, and 6.1) will be evaluated based on their quality using the Phase 2b scale below. If a parameter is Not Met, the 0 score from Phase 1a must be used for the numeral score of how well each parameter was demonstrated in Phase 1b. Each judge will also evaluate the marketing plan submitted using the 0 (Not Provided) to 5 (Excellent) scale (Phase 1c). Judges must provide brief comments for each of their scores.

An individual judge’s Phase 1b and Phase 1c scores will be added together to determine the submissions’ score for that particular judge. Every judge’s score will be averaged for that submission to determine the Final Overall Score. The Met/Not Met judge scores will also be averaged to determine how far an Entrant has met the Levels of Achievement. The entries with the highest Final Overall Score (ranging from the top three to the top five) who complete all parameters through at least Level 4 will be selected as finalists (assuming they meet all of the eligibility requirements).

PHASE 2 – FINALISTS ONSITE

In the first day of demonstrations (Phase 2a), finalists will run their technology on their surrogate drawers, with the judges evaluating how well their technology compares to what was demonstrated via their online submission. In the second day of demonstrations, each finalist will be provided with Cornell drawers containing real insect specimens. Submissions will be evaluated by each judge again using the Phase 2b and Phase 2c scales. Equivalent drawers will be provided to each finalist onsite.

Final scores will be determined by adding a judge’s Day 1 and Day 2 scores (Phase 2a + Phase 2c) and then averaging the scores of all judges. The Phase 2b average scores will be used to determine the degree to which an Entrant has met the Levels of Achievement. An Entrant must again meet every parameter through Level 4 to qualify for selection as the final winner.

TIE-BREAKERS

In the event of a tie (in either Phase 1 or Phase 2) to determine the finalists or the winner, the tied entries will be evaluated based on the length of time it takes for their technology to complete all of the parameters. This will be based on the provided metadata timestamps. If the time that the tied technologies complete all of the parameters is within +/- 10%, then technology footprint (i.e., the amount of space the device occupies) will be used to determine the ranking of the submissions.

SCORING SCALES – PHASE 1

Phase 1a - Met/Not Met Evaluation for Each Level of Achievement Parameter

Provide a score using the scale below. Use whole numbers only.

| | |
|---------|---|
| Met | 1 |
| Not Met | 0 |

The score should indicate whether each parameter was Met or Not Met. If a parameter is Not Met, the 0 score must be used for the Numerical Scoring of how well each parameter was Met.

Phase 1b - Numerical Scoring for Each Level of Achievement Parameter

Provide a score where indicated using the 5 (highest score) to 0 (lowest score; not met) scale below. Use whole numbers only.

| | |
|-----------|---|
| Excellent | 5 |
| Very Good | 4 |
| Good | 3 |
| Fair | 2 |
| Poor | 1 |
| Not Met | 0 |

Excellent: The merit of this parameter far exceeds what is requested. There are almost no flaws, with no perceived risk of damage to the specimens and all labels being put back in nearly their exact original positions.

Very Good: The merit of the parameter is above what is requested. There are a few minor issues with the parameter, although not especially significant, that prevent placement of this parameter in the highest merit group. There is very minimal perceived risk of damage to the specimens and labels appear to be put back in their original positions.

Good: The merit of the parameter meets the minimum acceptable level of what is requested. There are not many issues with the parameter, with minimal perceived risk of damage to the specimens and the labels appearing to be put back in mostly their original positions.

Fair: The merit of this parameter is below what is requested. There is some value in the output, but the parameter has issues, such as a perceived risk of damage to the specimens and not all labels being put back in their original position.

Poor: The parameter is far below what is requested. There are a number of issues with the parameter, such as a high perceived risk of damage to the specimen and the labels not being put back in their original position.

Not Met: The submission did not meet the requirements of this parameter.

Phase 1c - Numerical Scoring for the Marketing Plan

Provide a score for the Entrants marketing plan using the 5 (highest score) to 0 (not provided) scale below. Use whole numbers only.

| | |
|--------------|---|
| Excellent | 5 |
| Very Good | 4 |
| Good | 3 |
| Fair | 2 |
| Poor | 1 |
| Not Provided | 0 |

The marketing plan cannot exceed 4-pages and must discuss how the technology would be made available to collections to assist them in solving the national problem of digitization. The technology could be made available at cost. The marketing plan must be evaluated based on the following:

- The plan appears well thought out and appropriate/reasonable
- The plan proposes potential methods for deploying the technology
- The costs and estimates seem reasonable
- The plan is comprehensive

SCORING SCALES – PHASE 2

Phase 2a - Numerical Scoring for the On-Site Surrogate Drawer Demonstration

Provide a score for the Entrants marketing plan using the 5 (highest score) to 1 (lowest score) scale below. Use whole numbers only.

| | |
|-----------|---|
| Excellent | 5 |
| Very Good | 4 |
| Good | 3 |
| Fair | 2 |
| Poor | 1 |

The score must reflect how well the technology onsite compares to what was demonstrated in the first phase of judging using the surrogate drawer.

Phase 2b - Met/Not Met Evaluation for Each Level of Achievement Parameter

Provide a score using the scale below. Use whole numbers only.

| | |
|---------|---|
| Met | 1 |
| Not Met | 0 |

The score should indicate whether each parameter was Met or Not Met. If a parameter is Not Met, the 0 score must be used for the Numerical Scoring of how well each parameter was Met.

Phase 2c - Numerical Scoring for Each Level of Achievement Parameter

Provide a score where indicated using the 5 (highest score) to 0 (lowest score; not met) scale below. Use whole numbers only.

| | |
|-----------|---|
| Excellent | 5 |
| Very Good | 4 |
| Good | 3 |
| Fair | 2 |
| Poor | 1 |
| Not Met | 0 |

Excellent: The merit of this parameter far exceeds what is requested. There are almost no flaws, with no perceived risk of damage to the specimens and all labels being put back in nearly their exact original positions.

Very Good: The merit of the parameter is above what is requested. There are a few minor issues with the parameter, although not especially significant, that prevent placement of this parameter in the highest merit group. There is very minimal perceived risk of damage to the specimens and labels appear to be put back in their original positions.

Good: The merit of the parameter meets the minimum acceptable level of what is requested. There are not many issues with the parameter, with minimal perceived risk of damage to the specimens and the labels appearing to be put back in mostly their original positions.

Fair: The merit of this parameter is below what is requested. There is some value in the output, but the parameter has issues, such as a perceived risk of damage to the specimens and not all labels being put back in their original position.

Poor: The parameter is far below what is requested. There are a number of issues with the parameter, such as a high perceived risk of damage to the specimen and the labels not being put back in their original position.

Not Met: The submission did not meet the requirements of this parameter.

EDITING A SUBMISSION

It is the responsibility of the Entrant to thoroughly review their materials before submission. On occasion, however, the Entrant may identify a problem with a portion of the entry after it has been submitted electronically to the Competition Web site.

AIBS and NSF will allow the Entrant (via the team leader) to request the replacement of files or revision of other submission materials or fields (such as the team member list), associated with a previously submitted entry. A request for a Submission Entry Update must be submitted via email (to beyondthebox-info@aibs.org) from the team leader via their email address provided on the entry form and be electronically signed by the designated team leader.

A Submission Entry Update must contain a justification that addresses:

- Why the changes or file replacement are being requested.
- Any and all differences between the original and proposed replacement files or submission fields.

AIBS and NSF will accept a Submission Entry Update if it is submitted *before*:

- The deadline date specified in the Competition rules.
- After the Competition closes but by 5:00 PM Eastern on September 6, 2015.

A Submission Entry Update after these time frames will not be accepted.

When a request is accepted, the Entrant will be granted access to their submission to make the approved changes. The proposed files or revisions to submission attributes will replace the existing files and become part of the official submission.

AIBS and NSF will consider only one request for a Submission Entry Update per entry at a time.

Only the Submission Entry Update requested in writing may be updated. Altering any other fields or files could result in disqualification of the entry from the Competition.

APPENDIX DOCUMENTS

The following is a list of the appendices for this Competition. They can be downloaded from the beyondthebox.aibs.org Web site.

Appendices A through I provide measurements and specifications for the required surrogate drawer, unit trays, and associated specimens, labels, and capsules. Appendix K is the template to be used for providing the database and Web interface access information as well as the Entrant's marketing plan.

Appendix A – Surrogate Drawer Specifications

Appendix B – Unit Tray 1 Content and Specifications

Appendix C – Unit Tray 2 Content and Specifications

Appendix D – Unit Tray 3 Content and Specifications

Appendix E – Unit Tray 4 Content and Specifications

Appendix F – Unit Tray 5 Content and Specifications

Appendix G – Unit Tray 6 Content and Specifications

Appendix H – Unit Tray 7 Content and Specifications

Appendix I – Unit Tray 8 Content and Specifications

Appendix J – Drawer Layout

Appendix K – Database Access, Web Interface Access, Marketing Plan Template

OFFICIAL RULES

- Competition submission constitutes an agreement by the Entrant to adhere to the rules, requirements, and conditions set forth by the Competition Sponsor (the National Science Foundation [NSF]) and Organizer (the American Institute of Biological Sciences [AIBS]).
- Any Entrant found to be in violation of any rules will be disqualified.
- If the selected winner fulfills all of the Level 4 Achievements (but not all of Levels 5 or 6), they will be awarded \$500,000 USD. If the selected winner fulfills all of the Level 5 Achievements (but not all of Level 6), they will be awarded \$750,000 USD. If the selected winner fulfills all of the Levels of Achievements set forth for the Competition, including all of the Level 6 parameters, they will be awarded \$1,000,000 USD. Only one winner for the Competition will be selected. A maximum of \$1,000,000 USD will be awarded, depending on the level of accomplishment achieved by the winner.
- No Entrant may use the logo or official seal of the National Science Foundation or the American Institute of Biological Sciences in their submission, and must not claim endorsement by the Sponsor, the Organizer, or the Beyond the Box Innovation Competition.
- Any submission materials received by the Organizer that were not requested in the official entry form will not be provided to the judges.
- Per 15 USC Sec. 3719 - Prize competitions:

“An individual or entity [defined as “Entrant” for this competition] shall not be deemed ineligible under subsection (g) because the individual or entity used Federal facilities or consulted with Federal employees during a competition if the facilities and employees are made available to all individuals and entities participating in the competition on an equitable basis.”
- All federal, state, and local laws must be followed.
- By submitting to the Competition, each Entrant warrants that he or she (or a member of the team) is the author and owner of any copyrightable works and/or possess any necessary intellectual property rights associated with the submission, that the works are original with the Entrant (or are an improved version of already existing work that the Entrant has rights to use and improve upon), and that the Entrant does not violate or infringe any copyright, intellectual property, or other rights of any third party, as protected under U.S. law.
- AIBS and NSF have no responsibility for any proprietary information or intellectual property submitted to the Competition.
- Each Entrant retains full ownership of their submission.

- The Sponsor and Organizer reserve the right to disqualify any Entrant from the Competition for entering any submission that is not his or her own.
- By participating in the Competition, each Entrant grants to the Sponsor a limited, non-exclusive, royalty-free, worldwide license and right to reproduce, publicly display, publicly perform, and use images and/or videos associated with the submission to the degree required to administer the Competition, and to publicly perform and publicly display the Submission, including, without limitation, for advertising and promotional purposes relating to the Competition.
- AIBS, NSF, and Beyond the Box Innovation Competition reserve the right to use semifinalist and finalist winners' names, likenesses, associated institutions, team names, and entries for educational publicity as well as promotional purposes, including promotion on Web sites and in press releases, exhibition of the winning Entrant, etc. It is understood that entries will be shared with reporters covering these awards and for promotion of the Competition.
- The Winner is responsible for all taxes and other fees connected with the prize received as well as any travel that might be paid for by the Sponsors.
- Per 15 USC Sec. 3719, by participating in this Competition, each Entrant agrees to assume any and all risks and waive claims against the federal government and its related entities and the American Institute of Biological Sciences, except in the case of willful misconduct, for any injury, death, damage, or loss of property, revenue, or profits, whether direct, indirect, or consequential, arising from participation in this Competition, whether the injury, death, damage, or loss arises through negligence or otherwise. By participating in this Competition, each Entrant agrees to indemnify the federal government and the American Institute of Biological Sciences against third party claims for damages arising from or related to Competition activities.
- All Entrants agree that they, their heirs and estates shall hold harmless the United States, the employees of the federal government, and all employees of AIBS for any and all injuries and/or claims arising from participation in this Competition, to include those that may occur while traveling to or participating in Competition activities.
- NSF and AIBS are not be responsible for any claims or complaints from third parties should the entries be published or exhibited.
- AIBS and NSF reserve the right to cancel, suspend, and/or modify the Competition, or any part of it, for any reason, at their discretion.
- If an insufficient number of qualified entries are received, the Sponsors have the right to modify or cancel the Competition prior to announcing any winners.
- The Competition Sponsor and Organizer reserve the right to update, amend and augment rules, should that be necessary to ensure a fair and open Competition. Any and all modifications will be publically announced and noticed on the beyondthebox.aibs.org Web site and sent to the email addresses that have been provided to the Sponsor and Organizer for all interested, potential, or actual Entrants.
- As this Innovation Competition is, in part, designed to stimulate innovation and develop a new resource for solving a national problem, the winning Entrant agrees to explore with the

Organizer and Sponsor opportunities for making the winning submission available to help digitize the nation's insect specimens.

- The Competition Sponsor and Organizer, at their discretion, have the right to disqualify any Entrant from the Competition if they believe that the Entrant displays what would be considered inappropriate practices; undermines the Competition through cheating, deception, and/or any other unfair action; and/or threatens, intimidates, abuses, or harasses the Competition Sponsor, the Competition Organizer, any other Entrants, or the judges.

CONTACT INFORMATION

Please review the FAQ section of the Web site (<http://beyondthebox.aibs.org>) before submitting any questions.

For questions related to the Competition rules and requirements contact:
beyondthebox-info@aibs.org

For issues related to submitting (timeouts, errors, etc.) contact:
beyondthebox-support@aibs.org

For press questions contact:
beyondthebox-press@aibs.org