"Most people say that it is the intellect which makes a great scientist. They are wrong: it is character." Albert Einstein

Guidelines for Einstein Supernova Award Applications

This Guide to Einstein has been written to help Scouts, Einstein mentors and local councils navigate the Dr. Albert Einstein Gold Level Supernova Award application process.

As of June 1, 2022, Einstein Supernova awards will no longer require approval by the National STEM in Scouting committee. They will be approved at the local council level but will maintain the highest quality standards. If your council does not have an active STEM committee then approval can be sought through a local Advancement and Recognition Committee, an ad hoc STEM committee, or from one of several councils around the nation that have active STEM committees.

Another important change to the Einstein Award is the extension to Scouts BSA age 14 to 18 years old and First Class.

This document contains:

- Award requirements
- Mentor notes
- Project proposal approval
    - Project proposal review criteria
- Guiding the Research
- Submission process
- Final submission approval
- Appendices
    - Sample experiments or projects
    - FAQ's and Einstein Process Flow Diagram

To maintain the integrity and prestige of this award, the highest standards of excellence must be applied throughout the process, and at all stages of review.

Dr. Albert Einstein Supernova Award Requirements

Gold Level Supernova Award for Scouts BSA, Venturers and Sea Scouts

1. Earn either the Thomas Edison Supernova Award while a registered Scouts BSA or the Wright Brothers Supernova Award while a registered Venturer or Sea Scout (hereafter referred to as Scout).

2. Complete FOUR additional Supernova activity topics, one from each of the four different STEM areas.
    a. Note: The intent is that upon completion of the Dr. Albert Einstein Supernova Award, the Scout will have completed two Supernova activity topics in each of the four STEM areas for a total of eight.
3. Create and propose a new Nova-like award for any program (Cub Scout, Webelos Scout, Scouts BSA, Sea Scouts, or Venturing), comparable to the existing Nova Awards at that program level. Prepare a written outline for this proposed Nova Awards topic and submit it to your mentor.
4. With guidance from your mentor, select a current STEM-related concern and develop a research project or experiment ("the project") related to that area. Prepare a one-page written proposal detailing your scientific hypothesis or engineering objective and your proposed experimental methods, which must be approved by your council's STEM Committee before you begin work. Execute the project or experiment, and then prepare a complete and well-documented written report AND an oral presentation. Present both the oral and written reports to your mentor and to your local council STEM committee.
    a. This research project or experiment should be challenging and should require a significant investment of time and effort on your part. (A guideline would be approximately 100 hours.)
    b. If your mentor is not a specialist in the area of your project or experiment, they will request assistance from a specialist who will serve as a STEM consultant.
5. Submit the Einstein Supernova application along with all the supporting documentation, reports, and data for all parts of all requirements to your council's STEM Committee chair (or Advance Committee Chair), who will coordinate the group's review and convey their decision.

Mentor Notes

Candidates for the Dr. Albert Einstein Supernova Award must work under the guidance of an approved mentor who is not their parent/guardian/unit leader, but who is a STEM professional or person highly qualified in a STEM field. The mentor must be approved by the council's STEM committee in advance, complete BSA Youth Protection Training (YPT), complete Einstein Mentor Training and be registered with the council as a Supernova mentor (job code 52).

The council is encouraged to provide guidance, training, and certification to qualified mentors. The role of the mentor is to guide the candidate when selecting significant STEM research projects and to coach the youth into preparing, researching, consulting others, designing, planning, and carrying out the research. The mentor must approve the application, verify that the candidate's activities have been monitored and reviewed, and ensure that all work was of the highest quality. Ideally, the mentor and Scout will develop a professional relationship that will outlast the presentation of the award.

If the mentor is not a subject matter expert (SME) that the field of the project chosen, it is their responsibility to help the Scout find an SME to work with. The SME also needs to be current in YPT.

Project Proposal Approval

It is required that the candidate have the project (requirement #4) reviewed by the local council's STEM committee before significant work begins. This review ensures that the proposed project is of sufficient

scope and intellectual content and serves to preempt issues at the final review (like the way an Eagle Scout project proposal is reviewed before work begins).

The project should be of significance and value to both the Scout and to the STEM community, with the Scout making a meaningful contribution to a STEM field. An Einstein project cannot be primarily developed for an organized competition. It cannot consist primarily of following instructions developed by someone else. Most importantly, the Scout must be involved in the planning, development, and must make a significant intellectual contribution to the project.

The Scout should send a one-page project proposal to the local council's STEM committee chair, with a copy to their Supernova mentor. The Scout may not start work on the project until it has been approved by the council.

Project Proposal Review Criteria

A one-page written proposal is the starting point for the project. Many Scouts have never written a document like this, and even many STEM-trained adults may have a difficult time constructing a proposal. The proposal must convey a tremendous amount of information in a brief format.

One approach would be to answer the following questions:[1]

1. What are you trying to do? Explain it with no jargon.
2. How is that challenge currently addressed? What are the shortcomings and limitations?
3. What is the new idea, and why is it superior to the existing approaches?

A brief description of the mentor's credentials must be attached to the proposal.

Once ready, this proposal MUST be submitted and approved by the council STEM Committee before the scout starts work. The committee may require revisions and clarification or suggest a change in scope.

Guiding the Research

Once the proposal has been approved, the scout can commence work in earnest. The Scout does the project and the mentor guides, asks questions, and encourages. When outside expertise is needed the mentor should facilitate that interaction and learning.

It is critical that the work be clearly documented, ideally in writing and conversations with the mentor. This will facilitate the composition of the final report and presentation and provide the additional proof of the work.

[1] These questions were inspired by the Heilmeier Catechism, (https://www.darpa.mil/work-with-us/heilmeier-catechism) pioneered by Dr. Heilmeier while directing the Defense Advanced Research Projects Agency to ensure all proposals were well-researched and supported. You will find that high school students (and adults!) are perfectly capable of understanding this, and with your mentoring can produce exceptionally strong research ideas.

You should expect the Scout to spend approximately 100 hours on this project. You can expect a significant investment on your own part as well, through updates and feedback that can run on for many months. However, if the scope of the proposal is correct, the work should be comfortably completed within a year.

Once the work is completed, the Scout must prepare and present both a written report and oral presentation of the work. There is no formal length for either; however, both must correctly and completely explain and detail the project. As a guide, the written report will likely exceed 10 pages, and the oral presentation should take approximately 45 minutes, plus time for questions.

This entire process is likely to take several iterations. Remember, the Scout has likely never undertaken this type of report and will require strong guidance.

Finally, the Scout will present their research to the council STEM committee. The report should be submitted well in advance of the presentation so that the committee members may have time to review it and provide feedback. The formal presentation with the committee may vary but will likely run approximately 45 minutes with plenty of time for questions. The presentation can be live or online.

Your job as a mentor is to help prepare the applicant in advance so that everything goes smoothly. Remember that the committee is there to ensure that the scout is successful. Their expectations are that the Scout has mastery over the fundamentals of the underlying science, the questions being investigated, and what methods were used. The candidate should explain the work in a clear, organized fashion, comprehensible to an adult with a STEM background. Finally, the conclusions should be supported by the results. This is a lot to ask of a young adult. Apart from research, you may find that coaching and encouraging are equally important to the scout. Encourage persistence, simplicity, and staying positive!

Submission Process

All Einstein Supernova Awards must be approved by the local council STEM committee. The Council Einstein Award Review committee will be made up of three to six STEM committee members—no more and no less. This committee should be composed of knowledgeable professionals who are active in STEM fields. The candidate will not only provide written copies of all activities, reports, the proposed Nova, and other work, but will also deliver both an oral presentation and a written report on their research project to this committee in a formal setting (scheduled well in advance, with appropriate visual aids, including time for questions from the audience, and so on).

The council STEM committee will evaluate the work. Consideration should be given to how much the candidate contributed to the research project or experimental effort, and the extent to which the candidate has learned from that experience. Detailed review criteria are below.

Applications will be reviewed as quickly as possible. While all work must be completed and approvals obtained prior to the candidate's 18th birthday if Scouts BSA, or 21st birthday for Venturer and Sea Scouts[2], applications will be accepted for review up to three months beyond that date. The candidate

[2] If a Scouts BSA wants or needs to work beyond their 18th birthday, they will need to join a Venturer Crew or Sea Scout Ship.

and the Supernova mentor will be notified as soon as possible of the committee's decision. The committee may request additional information before making a decision.

Final Submission Approval

The application, with all supporting documentation, is the primary basis upon which decisions are made. The following checklist will be used by the local council committee when reviewing applications. The list may also be used by candidates to help in preparing their applications.

In addition to the application form, the candidate must submit complete documentation of all requirements, including:

- ❑ Date that the Thomas Edison Supernova Award or Wright Brothers Supernova Award was earned.
- ❑ Worksheets or reports on all activities, showing data collected, analysis, and conclusions.
- ❑ Proposed new Nova award, in the same format and style as existing Nova awards.
- ❑ Written report on the research project or experiment, including:
    - Description of origin of project idea
    - Documentation of council STEM committee's approval of the proposal.
    - Background science and hypothesis
    - Where work was conducted, and under whose supervision
    - Methods used
    - Results and conclusions
    - Future work resulting from this project or experiment
    - Supporting materials (photographs, news articles, letters of appreciation, sketches, and copies of lab notebooks).
    - Total number of hours spent on this project or experiment.

- ❑ Date of oral presentation to the council STEM committee and their feedback on the presentation.
- ❑ If the work was presented or published in a scientific forum, that should be noted; however, it is not required.
- ❑ The submission packet is best submitted digitally, e.g., Google docs, DropBox, One Drive, etc.

Neatness counts. Consideration will be given to a neat, concise, organized package. The candidate should give special care to the appearance of the application and the thoroughness and correctness of all information provided. Missing or inaccurate information may delay review of the application while it is requested. While it is not required that all information must be typed, all information must be clearly legible.

Applications will be evaluated according to the following criteria:

Procedural (these are requirements)

- Were all requirements completed while the candidate was a registered Scouts BSA, Venturer or Sea Scout?

- Were all requirements completed before the candidate's 18th birthday if Scouts BSA, or 21st birthday for Venturer and Sea Scouts?
- Has the candidate completely met all the requirements for the Einstein Supernova Award, as evidenced by the documentation provided?
- Was the mentor not the candidate's parent, guardian, or unit leader?
- Was the mentor approved in advance by the local council? Were they a registered Scouter? Were they current in their YPT training?
- Had the mentor completed Einstein Mentor training? (Strongly recommended but not required)
- Did the candidate submit a complete application form?
- Were all required signatures obtained?

Proposed Nova-like Award (these are requirements)

- Did the candidate draft a Nova-style award for Cub Scouts, Webelos, Scouts BSA, Venturers, or Sea Scouts?
- Was it written in the current format of Nova awards?
- Were the existing Nova awards on https://www.scouting.org/stem-nova-awards/awards/ viewed so that the Scout's new Nova (per req 3) is not a duplicate of an existing award?
- Is the Nova-like award innovative?
- Are there significant and original hands-on activities?
- Are the requirements appropriate for the level chosen? Are they possible for Scouts with limited resources, and challenging for Scouts with significant resources?
- Are sufficient background material and counselor notes included?

Research Experiment or Project (these are suggestions, not requirements)

- Based on the documentation provided, has the candidate completed a substantial STEM research project or significant experiment using the scientific method?
- Was the research project original? Did the results add to the general body of human knowledge?
- Is the work that the Scout did original?
- Was the project approved in advance by the local council STEM committee? (requirement)
- Was a literature search made to verify that the project was original and/or was substantial and meaningful?
- Did the Scout learn new skills or technologies to conduct the research?
- Was the candidate working with other STEM professionals as colleagues?
- How much time was spent working on the project?
- How involved was the mentor in developing the project and guiding the Scout?
- Did the candidate document the project thoroughly, in an appropriate manner?
- Was information included on reasons for choosing this project, scientific background, hypothesis, materials and methods, results and conclusions, future work, references, coworkers, and supervisors?
- Was the written report thoroughly documented, with appropriate references?
- Does the research demonstrate excellence and meet the high-quality standards of the award?
- Is the research clearly a significant undertaking and accomplishment for the candidate?
- Did the candidate present a polished oral report to the appropriate committee, with appropriate visual aids?
- Was the candidate able to answer questions about the research?

Appendices

Sample Experiments and Projects

- Scout researched, examined, and compared various General Circulation Models of Saturn's moon Titan to identify the one that would most accurately allow identification of the locations of updrafts on that body. They then used the best model to analyze the practicality and feasibility of a glider mission on Titan, which could use updrafts to improve both range and endurance. It was determined that a glider mission would be practical and feasible, with a maximum glider range of 4000 km, about a quarter of Titan's radius, and a maximum endurance of about 3.5 Earth days. Results were presented at three international scientific conferences.

    1. 17th AIAA Aviation Technology, Integration, and Operations Conference, the AIAA AVIATION Forum, 2017 June 5-9, Denver, Colorado. "Optimizing Autonomous Glider Designs for the Exploration of Outer Solar System Atmospheres" by C. Colletti, R. P. LeBeau, and G. Bramesfeld.
    2. Organisation Scientifique et Technique du Vol à Voile Congress XXXIII in Benalla, Australia, 2017 Jan "Investigating Designs of Autonomous Glider Exploration of Outer Solar System Atmospheres," C. Colletti, R. P. Lebeau, and G. Bramesfeld.
    3. Organisation Scientifique et Technique du Vol à Voile Congress XXXII in Leszno, Poland. July 2014. "Exploring the Possibility of Autonomous Gliders in the Atmosphere of Titan." LeBeau, R.P., Colletti, C., Bramesfeld, G.

- Developed a machine learning classifier to predict glaucoma drainage device failure after optical surgery and compared results to predictions made by ophthalmologist collaborators. Results currently in press by a scientific journal.

- Developed a static star model on a quantum field background, then let the pressure of the star fall to zero, collapsing the simulation into a black hole. The model was used to examine the boundary between the black hole and empty space, searching for possible sources of Hawking radiation.

FAQs

Q: Can a mentor invite other subject matter experts to advise the Scout?
A: Yes, one of the methods of Scouting is association with adults and it is particularly relevant for Einstein projects when the specific expert may not be a Scouter. YPT guidelines must be followed.

Q: What if our council does not have a STEM committee?
A: The council Advancement and Recognition committee can appoint a subcommittee for this purpose, or the council can create an ad hoc committee.

Q. Can a science fair project be used for the Einstein Supernova?
A. Yes, if it meets the standards / requirements of the Einstein project as detailed above. This is unlikely for a typical high school science fair but may be possible for something like the Regeneron International Science and Engineering Fair.

Q: Does the research have to be performed at a company or university?
A: No.

Q: If records of completion for requirements cannot be located, a scout may be asked to repeat them.
A: Yes.

Q. Can the Einstein project be done as part of a team?
A. No.

Q: Ideally, how should the Einstein Supernova award be presented?
A: Presentation of the Albert Einstein Supernova Award should be made at a significant event, such as a major STEM event, annual council Awards event or other high-profile scouting function.