

# The Space Race



**39<sup>th</sup> Annual Physics Field Day**

**Presented by Creighton University's  
Society of Physics Students**

**Saturday, March 23, 2013**

**CELEBRATING 50 YEARS OF CREIGHTON PHYSICS CLUB**

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# Greetings!

You are invited to the Creighton University Physics Department's Physics Field Day 2013! On **Saturday, March 23**, you and your team of high-school physics students will duke it out with other local high schools for the title of "Field Day Champion." This year's theme is "The Space Race," and a secondary theme of "The Last Fifty Years" gives us the opportunity to honor the 50<sup>th</sup> Anniversary of the Physics Club, and the 39<sup>th</sup> Annual Physics Field Day!

If you have *any* questions, please email the Field Day Coordinator, Nathan Horst (nathanhorst@creighton.edu) and he will get back to you as soon as he can. Additional details and updates on Physics Field Day can always be found online at: <http://physicsweb.creighton.edu/content/field-day-hallfame>.

Nathan Horst—Field Day Coordinator

Kristina Ward—Creighton University SPS President



Creighton  
UNIVERSITY

# Registration

CUSPS 39th Annual Physics Field Day

Saturday, March 23rd

8:00 AM – 3:00 PM

Cost: The registration fee is \$15 per team plus \$3 per person. Breakfast and lunch will be provided for both teachers and students.

To register: please email the following information to [nathanhorst@creighton.edu](mailto:nathanhorst@creighton.edu):

1. School Name
2. Advisor's Name
3. Number of Teams

You may also mail the information to:

Patricia Soto  
Department of Physics  
2500 California Plaza  
Omaha, NE 68178

Or fax it to (402) 280-2140

**We request your registration information  
by March 8, 2013.**

# Chalk Talk

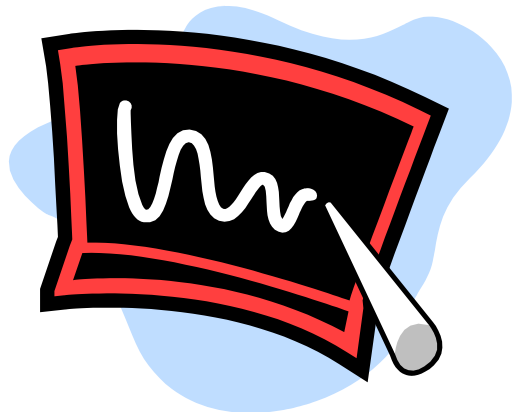
## Topic: The Last 50 Years/ The Space Race.

*In accordance with the theme of Field Day, and the marking of a monumental year for the Creighton Physics Club, each team will be assigned an influential scientist to serve as their team name at Field Day. This scientist, more specifically the work done by the scientist, will also be the subject of the Chalk Talk from the representative of each team. It is important to note that a mere history of the scientist's life is not encouraged, whereas a summary of the important work and some of the physical technicalities of said work is preferred.*

- I. Procedure:
  - a. One contestant per team.
  - b. Each contestant is allowed to bring no more than two five-by-seven inch index cards with notes.
  - c. The contestant will present his/her talk to three judges. The room will be open to students and teachers who are not giving a talk.
  - d. The speaker will be given no more than five minutes to present his/her talk. The judges will give the speaker a warning at four minutes in order to let the speaker finish within the time limit. The speaker will not be allowed to continue after five minutes have expired.
- II. Judging:
  - a. Delivery: In the delivery of the talk, the contestant should use smooth, concise

English and maintain eye contact with the judges. A contestant's poise during his/her presentation is also part of the judging criteria.

- b. Content: During talk itself, the following will be considered:
  - i. The amount of material covered.
  - ii. The logical flow of ideas.
  - iii. The quality of material covered.
  - iv. The creativity of the talk (originality)
- c. Questioning: After the talk the judges will take five minutes to ask the contestant relevant questions pertaining to the topic. The speaker's answers will be judged on the following criteria:
  - i. The accuracy of the answer.
  - ii. The relevance of the answer to the question.
  - iii. The ability to think about questions in unfamiliar areas of topic.
  - iv. Originality.



# Quiz Bowl

*This game is used to test the subtle points of physics and a team's ability to deal with physics problems of various levels.*

- I. Teams: Each team will consist of three individuals.
- II. The Game: Depending on attendance, the rounds will consist of two or four teams.
  - a. The game is comprised of three rounds.
    - i. The first round will have 10 questions worth 25 points. There will be an 8 second time limit to buzz in and a 5 second time limit to answer.
    - ii. The second round will have 4 questions worth 50 points. There will be a 15 second time limit to buzz in and a 5 second time limit to answer.
    - iii. The third round will have 1 question worth 100 points. Each team will have 2 minutes to work a problem and write down an answer. More than one team can score on the last question. Each team should have a captain who will give the answers.
- III. Equipment:
  - a. Students may not bring anything into the exam except a pen, pencil, scratch paper and calculator.

- b. Programmable calculators may be used, but their memory will be erased at the start of the exam.
  - c. Books or notes are not permitted.
- IV. Scoring: There will be a penalty of 10 points for a wrong answer in round one, and 20 points for wrong answers in round two. There will be no penalty for wrong answers in round three.
- V. General Information:
- a. Commonly used formulas and constants will be provided.
  - b. Proper use of these formulas should enable the team members to solve all of the problems.
  - c. Students are expected to solve basic problems in mechanics (kinematics, forces and energy), electricity and magnetism, simple circuits and, in accordance with the theme, general knowledge pertaining to the Space Race.





# Death Star Laser Aiming

*Purpose: Using the principles of geometric optics, participants will maneuver a beam of light to hit a specified target by reflecting and refracting the beam off and through a series of optical elements.*

- I. Team: Each team will consist of two or three members.
- II. Rules:
  - a. Each team will aim the beam blindly (with the laser shutter closed) except for three optional wild card shots of 5 seconds in duration.
  - b. Once the team has signified that they are satisfied with the placement of all the optical devices, the shutter is opened for scoring. At that time no optical elements may be moved, added, or subtracted.
  - c. Contestants are allowed to choose any appropriate path for the beam.
  - d. The path of the beam must be continuous. It must avoid touching anything other than optical elements. Support structures for apertures and previously positioned optical elements are considered immovable obstructions and must be maneuvered around.
  - e. The beam may strike any part of the optical element.
  - f. There will be a time limit in which to hit the target. Be ready to start on time!

- III. Equipment: Teams may bring in relevant texts, tables, calculators and pencils. Optical elements (lasers, mirrors, and prisms), meter sticks, protractors, and scratch paper will be provided. Contestants must bring all other equipment they deem necessary.
- IV. Scoring: Scoring will be based upon how many optical elements are successfully used as well as the radial distance from the beam to the center of the target. Bonus points will be given for unused wild card shots as well as the use of advanced optical elements such as prisms.



# Stairway to Heaven

*Purpose: To construct a brick structure on one side of a reference line with the largest overhang over the line.*

- I. Teams: Each team will consist of two individuals.
- II. Rules:
  - a. The structure must consist of only the materials provided.
  - b. The bricks may only touch the ground on one side of the reference line. The bricks overhanging the reference line may not touch the ground.
  - c. The overhang is defined as the horizontal distance from the reference line to farthest brick past the reference line without touching the ground.
  - d. Any number of attempts may be made with each being measured by the judge.
  - e. The structure must stand for 10 seconds before it will be measured.
  - f. Each team will have a 15 minute time limit.
- III. Equipment: Steps will be provided.
- IV. Scoring: The team's score will be the largest distance their stairway can traverse



# Circuit Building

*Purpose: Teams are aboard a starship which has suffered massive power failures. Teams must work to repair simple circuits before the portal back to Earth closes. With only 6 minutes until the closure, can you fix your ship to return or will you spend the rest of your years...lost in space?*

- I. Team: Each team may consist of up to three people, and there is only one entry per team.
- II. Rules:
  - a. Construction: Each team will be given the same instructions for constructing a circuit designed to perform a specific function, using various electrical elements to increase the complexity and accuracy of the circuit.
  - b. Competition:
    - i. All materials will be provided, including a variety of strengths for resistors, capacitors, and a power source.
    - ii. Teams will be judged on the accuracy and complexity of the circuit. Points will be awarded based on the number of electrical elements used and the range of elements used.
    - iii. There will be a time limit in which to complete a working circuit. If a team with a working circuit decides to add elements, but cannot get the resulting circuit to work, they will be judged on

the final circuit they produce, not the initial one.

- iv. If needed, additional teams will construct additional circuits in the case of a tie.

## Rocket Building

*Purpose: Each year, an intensive project that requires construction and planning prior to Field Day is designed. This project allows students to exercise creativity that goes above and beyond the time limitations of Field Day. This year's project will be rocket building, to align with the Space Race theme. The purpose of this event is to build a projectile that launches itself into the air. As the definition of a rocket is a projectile in which mass is expelled downward in order to propel the rocket upward, the projectiles that will be built will not necessarily be "rockets" but could be anything that shoots itself upward.*

- I. Team: There will be only one entry per team, but the entire team can be involved in the construction of the rocket.
- II. Construction: There are only a few specific requirements regarding construction that must be met, but failure to comply with these specifications will result in a disqualification.
  - a. Size: The projectile must be large enough that it is easily visible to the naked eye during all points in its flight.

- b. Budget: The absolute maximum limit to the cost of materials is \$50.
  - c. Rocket Kits: There are numerous materials designed specifically for rocket building. These materials will not be allowed, as the purpose of this event is to exercise creativity and produce innovative designs for propelling your projectile upward.
  - d. Launch Mechanisms: This project is not called catapult building, so we are looking for designs that feature largely internal launch mechanisms. External features such as guiding rods are encouraged, but the mechanism by which the launch is achieved should be mostly self-contained.
- III. Judging: These projects will be judged on the following criteria
- a. Height achieved by the “rocket”
  - b. Design aesthetics
  - c. Creativity





**Join the Race on March 23!**