

# 45<sup>th</sup> Annual Physics Field Day

Presented by: Creighton University's Society of Physics Students

Saturday, April 6<sup>th</sup>, 2018

## Accidental Discoveries

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## Introduction

You are cordially invited to the Creighton University Physics Department's Physics Field Day 2018! On Friday, April 6<sup>th</sup>, you and your team of high school physics students will compete with other local high schools for the prestigious title of "Field Day Champion."

This year's theme is "Accidental Discoveries". This year, we hope to offer students a chance to understand and learn more about physics with a dose of wittiness.

Additional details on Physics Field Day regarding previous winners can be found online at:

<https://physicsweb.creighton.edu/content/field-day-hall-fame>

## Registration

The registration fee is \$15 per team plus \$3 per person. Breakfast and lunch will be provided for both teachers and students. Payments may be made on the day of, on-site.

To register, please fill out the following form:

<https://goo.gl/forms/N4HZLP03tsQga8fX2>

**We request your registration information by Friday, March 23<sup>rd</sup>.  
Please let us know if this is an issue.**

If you have any questions, please email SPS President, Dan Pham ([danpham@creighton.edu](mailto:danpham@creighton.edu)). We will get back to you as soon as possible.

## Chalk Talk

Topic:

Accidental Discovery

Purpose: In accordance with the theme of Field Day, each team can choose a team name related to an accidental discovery in history (x-rays, radioactivity, microwave oven, etc). This discovery will also be the subject of the Chalk Talk from the representative of each team. The team name can also represent the school they are from (which also helps distinguishing teams interested in the same Chalk Talk topic). It is important to note that presenting a mere history of the discovery is not encouraged, whereas a summary of the important physical concepts in that discovery is much preferred.

This event is meant to be an opportunity for students to practice a technical presentation of the research they have done on the subject.

- 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.

## 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: Each team will aim the beam blindly (with the laser shutter closed) except for three optional wild card shots of 5 seconds in duration.
  - a. 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.
  - b. Contestants are allowed to choose any appropriate path for the beam.

- c. 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.
  - d. The beam may strike any part of the optical element. There will be a time limit in which to hit the target. Be ready to start on time!
- III. Equipment:
- a. Teams may bring in relevant texts, tables, calculators and pencils.
  - b. Optical elements (lasers, mirrors, and prisms), meter sticks, protractors, and scratch paper will be provided.
  - c. 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.

## Quiz Bowl

- I. Teams: Each team will consist of three individuals.
- II. The Game: Depending on attendance, the rounds will consist of two or four teams. The game is comprised of three rounds.
  - a. 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.
  - b. 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.

- c. 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. Since the theme this year is Ig Nobel, we will pose these problems in an eccentric manner.

## Insulation

Purpose: To insulate a thermometer using the provided materials, in order to keep the temperature as high as possible after the structure is placed in a refrigerated area.

- I. Teams: Each team will consist of two to four individuals.
- II. Rules:
  - a. The structure must consist of only the materials provided.
  - b. The structures will all be tested at the same time, and the results disclosed to teams at a later time.

- c. Each team will have a 10 minute time limit to insulate their thermometer
- III. Scoring: The team's score will be the temperature of the thermometer at the time of measurement, after cooling. Tiebreakers will be given based on the aesthetic qualities of the insulating structure.

## Catapult Building

Purpose: Teams will construct a catapult structure from the materials provided that are able to launch the object for the longest distance.

- I. Team: Each team may consist of up to three people.
- II. Rules: Each team will be given the same materials for constructing a catapult structure and will have 25 minutes to complete this task.
- III. Scoring:
  - a. Catapult will be judged based on the distance it can launch the object.
  - b. In the case of a tie, tiebreakers will be given based on aesthetic qualities and complexity of the structure.

## Paper Airplanes

Purpose: Each year, a 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 building paper airplanes.

- I. Team: This event is designed so every single individual can participate, and build their own paper airplane.
- II. Rules: 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. Materials: In order to standardize the competition, so no individual has unfair advantages, the only materials that will be allowed for building the paper airplane are paper, staples, paperclips and scotch tape.

- b. Weight: the paper airplane may have a maximum weight of 50 grams, and must be equal to or less than this weight value to be eligible.
- III. Scoring: These projects will be judged on the following criteria
- a. Distance travelled by the paper airplane
  - b. Distance from the designated target
  - c. Design aesthetics
  - d. Creativity
  - e. The highest scoring airplane from each team will be entered as the score for that team.

## Surprise Event