

**Creighton University
Department of Physics
Presents**

**Time
at
The
University**

Field Day 2012



Greetings!

You are invited to the Creighton University Physics Department's "Physics Field Day 2012"! On April 21st, 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." In light of the 2011 Nobel-Prize winning discovery regarding the accelerating expansion of the universe, our theme for this year will be "The Universe." While this will not affect many of our usual activities, we will be including some special activities this year, including our grand project, the telescope (more on that later).

If you have any questions, please email Dr. Jack Gabel (JackGabel@creighton.edu) and he or one of the members of our Field Day planning group will get back to you as soon as we can. Additional details and updates on Physics Field Day can always be found online at: <http://physicsweb.creighton.edu/content/field-day-hall-fame>

**Adam Hester, Matthew Armbruster,
Samantha Swerdfeger, Kristina Ward,
Lana Zholudeva—
Creighton Physics Club—Field Day Planning Group**

REGISTRATION

CUSPS 39th Annual Physics Field Day

Saturday April 21st

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 professors and students.

To register, please email the following information to jackgabel@creighton.edu:

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

You may also mail the information to:

Jack Gabel

Department of Physics

2500 California Plaza

Omaha, NE 68178

Or fax it to (402) 280-2140

We request your registration information by April 5, 2012.

TABLE OF CONTENTS

<i>Page</i>	<i>Subject</i>
3	Introduction
4	Registration Information
5	Table of Contents
6	Death Star Laser Aiming
8	Telescope Design
10	Chalk Talk
12	Cosmic Quiz Bowl
14	Hyperdrive Repair 101
16	Knockin' on Heaven's Door
18	Our Neighbors

DEATH STAR I

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 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.

LASER AIMING

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!

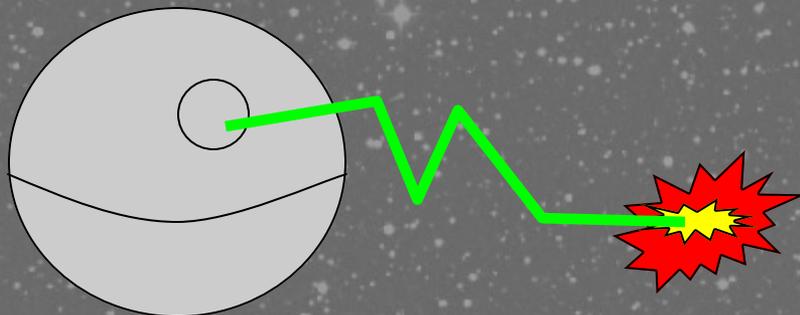
III.) Equipment:

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.



Telescope

Purpose: To apply basic principles of Optics in order to construct a working "telescope" (monocular) that will magnify a distant object and clearly allow one to view it as did the early 17th-century astronomers when looking above at the celestial sphere.

I.) Team:

Each team may utilize all of its members in the process of building the telescope. It is expected that the telescope will be completed, functioning and brought to the Field Day Competition immediately ready for trials.

II.) Rules:

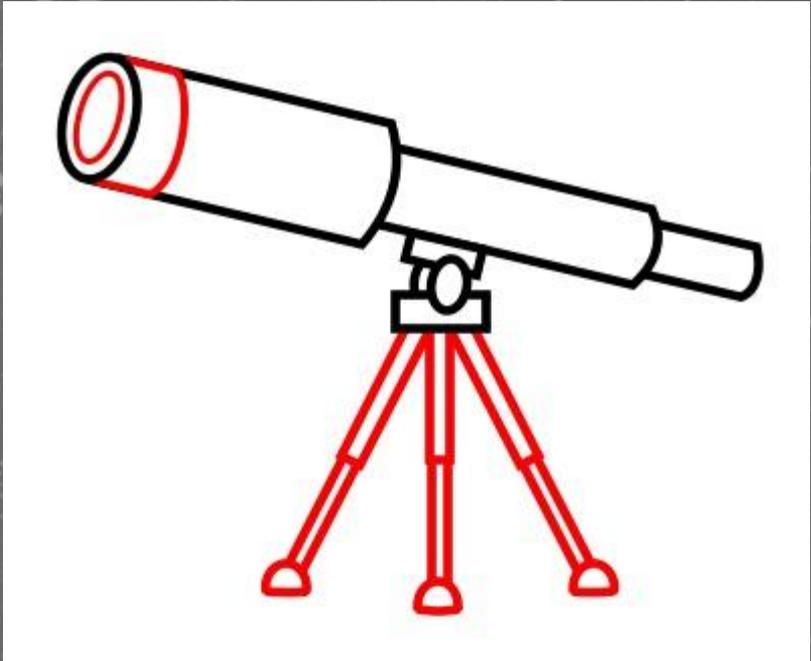
A.) Construction:

Each team must use exactly 2 lenses, along with structural components to hold the lenses in place, in order to build a functioning "telescope".

B.) Competition:

1. A sign will be placed some distance away that can be read at a multitude of magnifications, the highest of which being 10x.
2. Teams will be judged on the ability of their scope to convey to the human eye the information contained on the sign in a clear manner while preserving a reasonable field of view (for using the scope for a wider variety of purposes)
3. Teams will also be judged on the design of their scope, on both aesthetic and practical merits.

e Design



CHALK

Topic: *Exploring the Universe*

I.) Procedure:

One contestant per team. Each contestant is allowed to bring no more than two five-by-seven inch index cards with notes. The contestant will present his/her talk to three judges. The room will be open to students and professors who are not giving a talk.

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.



**Yell all you want,
sound doesn't travel
through space!**

TALK

B.) Content:

During talk itself, the following will be considered:

- 1. The amount of material covered.**
- 2. The logical flow of ideas.**
- 3. The quality of material covered.**
- 4. 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:

- 1. The accuracy of the answer.**
- 2. The relevance of the answer to the question.**
- 3. The ability to think about questions in unfamiliar areas of topic.**
- 4. Originality.**



COSMIC Q

Purpose: *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. The game is comprised of three rounds. 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. 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. 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.



HOW MANY
GALAXIES CAN
BE SEEN FROM
EARTH ?

QUIZ BOWL

III.) Equipment:

Students may not bring anything into the exam except a pen, pencil, scratch paper and calculator. Programmable calculators may be used, but their memory will be erased at the start of the exam. 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:

Commonly used formulas and constants will be provided. Proper use of these formulas should enable the team members to solve all of the problems.

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 Universe.

HYPERDRIVE REPAIR: 101

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:

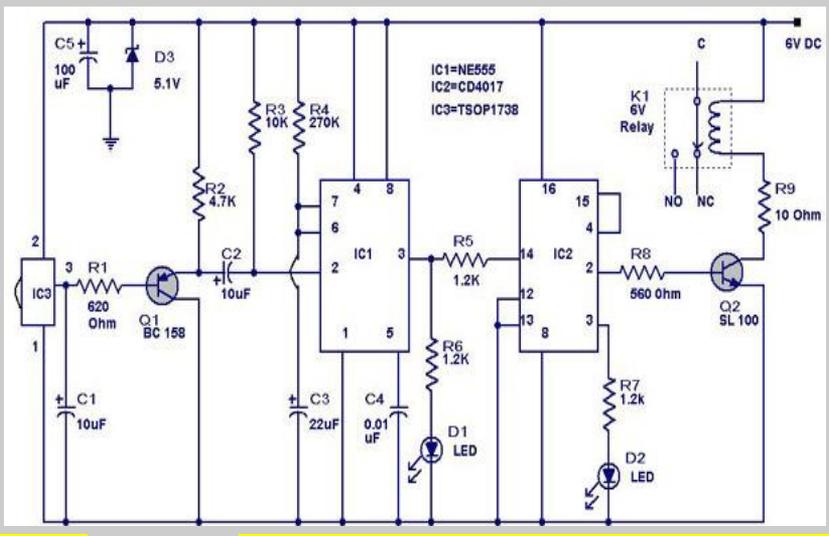
A.) Construction:

Each team will be given the same instructions for constructing 3 circuits that will each have to perform a specific function or meet some qualification under time constraints

B.) Competition:

1. All materials will be provided, including a variety of strengths for resistors, capacitors, different types of switches, light bulbs and power source.
2. Teams will be judged on accuracy and effectiveness
3. There will be 3 rounds of circuit building with a new circuit for each round.
4. If needed, additional teams will construct additional circuits in the case of a tie.

Let's see here... to make it to light speed I need to do what exactly?



Knockin' On

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.

Heaven's Door



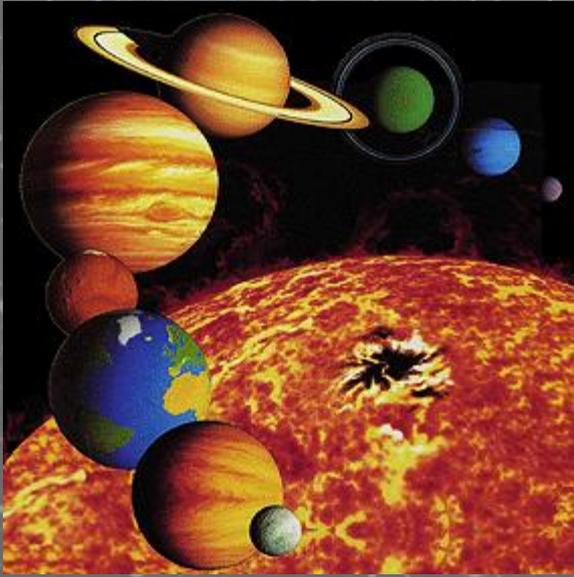
Our Next

Purpose: This game is used to test the students' knowledge of neighboring celestial bodies. Students will be given various pictorial representations of the planets within the solar system and will be asked to perform various naming and fact matching exercises relevant to the planets.

Teams: Each team will consist of at least four members (but no more than six)

The Game: Students will be given pictures of the planets within the solar system and a number of cards featuring various facts relevant to our celestial neighbors. Students will be asked to name the planets, match the facts to the planets, among other similar tasks.

ighbors



Scoring:
correct

(correct name, properly matched up fact, etc.) will be worth 2 points. There are no deductions for incorrect answers, only chances to earn points. If time permits, there will be a chance to earn bonus points in a similar activity involving constellations.

Each
answer



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