

# 2007 SPS Summer Internship S.O.C.K. & Compadre



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*University of Wisconsin--Platteville*



# ComPADRE

## Communities for *Physics* and *Astronomy* Digital *Resources* in *Education*

### Organization Chart

National Science  
Digital Library



ComPADRE

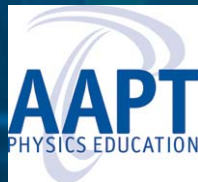


The Nucleus

### Partners



AMERICAN INSTITUTE OF PHYSICS



# ComPADRE Project Meeting

## The Nucleus—Web Usage

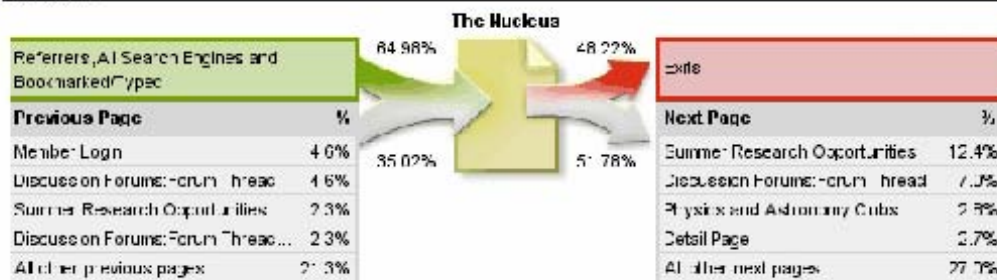
Company: NSDL  
 URL: <http://www.compadre.org>  
 Site: ComPADRE

OMNITURE  
 SiteCatalyst

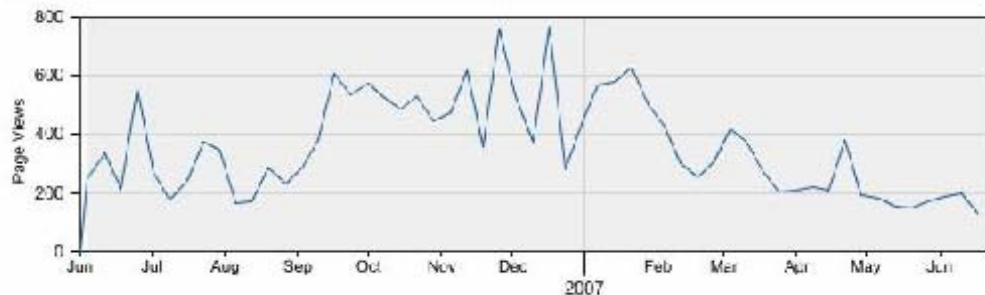
### Page Summary Report

Reporting Date: Thu. 1 Jun. 2006 - Sat. 30 Jun. 2007 Selected Page: The Nucleus

#### Navigation



#### Graph



### Mailing History

### Gary White Emails

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#### JOB HISTORY

160 records Page 1 of 8

MESSAGE_DATE	OPERATION	JOB_NAME	SENDER	RECIPIENTS	SUBJECT
6/12/2007 8:46:57 AM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 4007		Chapter report deadline, June 15---this Friday!
4/30/2007 2:52:06 PM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 3981		SPS seeks reporter at optics meeting in Baltimore next week
4/24/2007 2:09:07 PM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 3258		Volunteers sought for Physics Day at Six Flags Friday
4/24/2007 9:50:08 AM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 4103		Computational Physics Challenge (1.5K award), May 15th dead
4/15/2007 5:03:30 PM	MAIL-MERGE	SIGSPS_MAILING_MAILING	gwhite@AIP.ORG 13219		Virtual mentors needed for physics students
4/15/2007 3:21:32 PM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 4103		April 15 deadline for advisor (5K), student (1K) awards
4/4/2007 4:12:40 PM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 3258		SPS Zone 4 physics meeting on 4/21
3/21/2007 2:39:16 PM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 4049		cool physics outreach webinar tomorrow 6:30 pm
3/8/2007 1:16:53 PM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 3994		Physics computational award and travel awards for summer
2/8/2007 1:50:14 PM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 3972		SPS Scholarship Applications Due Feb. 15!
1/26/2007 10:43:34 AM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 3850		SPS Summer Internships--deadline Feb. 11!
1/14/2007 5:10:07 PM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 103		physics fun this Saturday and beyond in Seattle
1/4/2007 4:27:35 PM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 3850		SPS Internship applications due February 1!
12/20/2006 2:47:37 PM	MAIL-MERGE	SIGSPS_MAILING_MAILING	gwhite@AIP.ORG 12577		mentors needed, also physics haliku contest
12/19/2006 12:19:46 PM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 3880		hundreds of summer research jobs and a physics haliku contest
12/14/2006 9:47:00 AM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 111		SPS Zone 17 call for student presenters
11/30/2006 4:39:01 PM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 3915		scholarship apps., posters, summer research jobs
11/15/2006 9:56:25 AM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 3915		last call for SPS chapter awards, deadline today!
10/31/2006 9:02:49 AM	MAIL-MERGE	SPS_MAILING_MAILING	gwhite@AIP.ORG 109		SPS zone meeting in Las Cruces
10/26/2006 12:01:37 PM	MAIL-MERGE	SIGSPS_MAILING_MAILING	gwhite@AIP.ORG 12577		Funding for Sigma Pi Sigma alumni projects and Nov. 12 event

Show 20 per page

Business Systems and Operations - American Institute of Physics  
 (feedback) (change password) (logout)

# Some Planned Modifications

- Textbook Review Section
  - Addition of 80 new titles from NSDL collection.
  - Awaiting permission to cross link with reviews from American Journal of Physics & other reviews.
- Hiring of Forum Moderators to enhance discussion forum and overall activity on the website.

# Moderator Tasks

- Participate and add topics to discussion forums.
- Encourage physics clubs to sign up and post events in their region.
- Contact AZC's for information on events in their zone.
- Post a review of textbooks you are currently using.
- Come up with possible ideas for fun activities on the website.

# S.O.C.K.

## *SPS Outreach Catalyst Kit*

This kit was initiated in 2001 as part of a physics outreach effort by the SPS National Office.

### Goals

- *Provide SPS chapters with ideas for physics projects and demonstrations.*
- *Promote a student's natural curiosity to continue exploring the world around them.*
- *Encourage chapters to start physics outreach programs in their community.*
- *Present scientific inquiry as fun and exciting activities enjoyable for everyone.*

# 2006

ABSOLUTE  
ZERO *and the  
Conquest of Cold*

# Results

- 28 SOCK were available to chapters
- Over 65 chapters requested for a kit.
- Activities involved 30 SPS faculty & staff and nearly 130 SPS student members.
- Approximately 3,000 K-12 students reached.



Concordia College

Eastern Michigan  
University

& many more!



# Chapter Requests

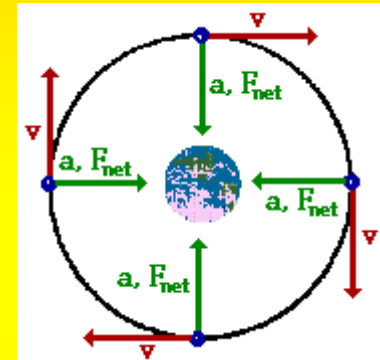
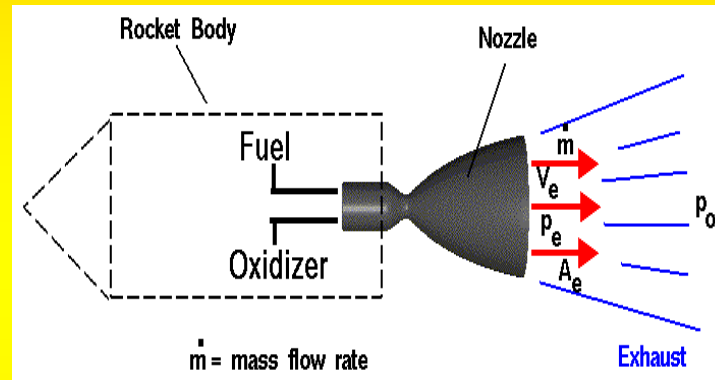
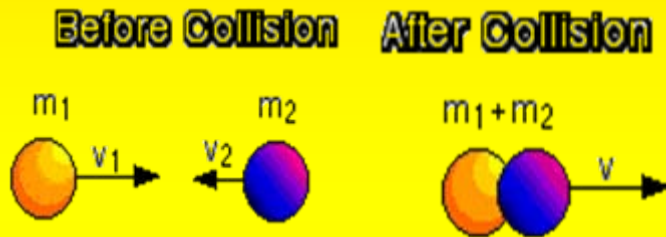
- We need to have projects which cover a wider range of students.
- Higher demand for more demos and hands-on activities which will grab their attention.
- More concise instructions on experiments.
- More experiments on the fundamental concepts of physics.
- Include activities which will relate to student's day-to-day experiences.

# This Year's Adjustments

## The Adaptive Lesson Plan

- Middle school students are targeted age group.
- Complete step-by-step lesson plans.
  - Suggestions & alternate experiments available to adjust for audience age level.
  - Lesson can be decomposed into individual demonstrations and experiments.
  - Estimate of time to prepare and implement lesson.
  - Complete technical pages on the use and set up of equipment.
- Suggested topics of discussion.
- Listing of additional web resources.

# 2007 SOCK Theme Motion & Collisions



# Crash Test "Smarties"

Adapted from lesson plan by: Lisa M. Weis



## The Gear



# Lesson Objectives

- Students will be able to describe the relationship between the starting height and the maximum speed of the dynamics cart.
- Students will be able to assess the amount of damage to a crash test dummy and draw conclusions regarding the safety of seat belt arrangements.
- Learn the various methods available for collecting data.
- Plotting information on graphs to derive mathematical relationships.

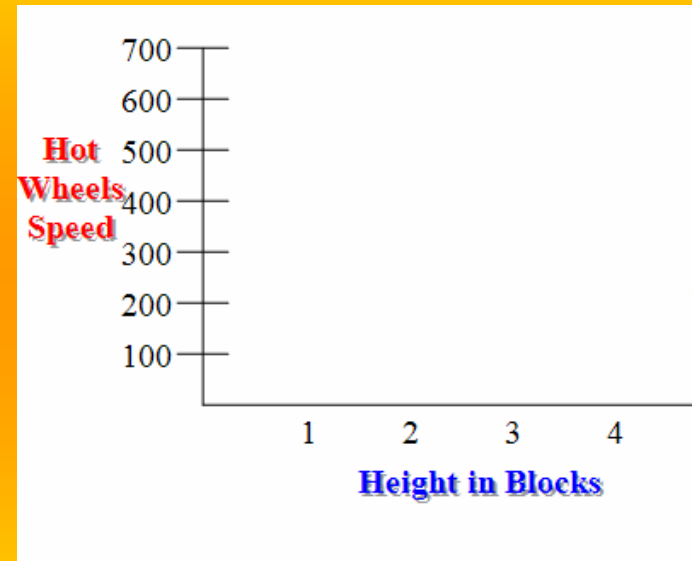
# The Plan & Testing

## *Tuckahoe Elementary School Experiment*

1. Have students measure & record final speed of the dynamics cart rolling down a ramp with varying heights.



2. Have the students plot their data on a global graph and then discuss the results of their recorded speeds vs. height of the ramp.



**Conservation of Mechanical Energy**

$$KE_i + PE_i = KE_f + PE_f$$

$$mgh = \frac{1}{2} mv^2$$

# What's the Big Deal??

How about applications in collisions and seat belt safety.



**Oh NO!**  
They're gonna hurt me!

3. Let's do some experiments with crash test dummies! (Mr. Bill)

4. Students created Play-doh figures and then used the same ramping system to test various speeds of collisions with different seat belt configurations.



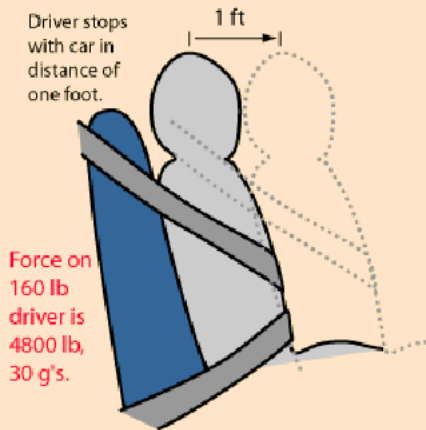
5. They observed the crash and rated the damage to each figure.

# Lesson Extensions

References to websites with additional information.

## Non-Stretching Seatbelt

Driver stops with car in distance of one foot.



Force on 160 lb driver is 4800 lb, 30 g's.

From example car crash scenario with car stopping in one foot distance from a speed of 30 mi/hr.

The task of the seatbelt is to stop you with the car so that your stopping distance is probably 4 or 5 times greater than if you had no seatbelt. A crash which stops the car and driver must take away all its kinetic energy, and the work-energy principle then dictates that a longer stopping distance decreases the impact force. For the example car crash scenario the stopping distance is one foot, the force on a 160 lb driver is about 4800 lb or 2.4 tons, and the deceleration about 30 g's. A moderate amount of stretch in the seatbelts will reduce the average impact force.

[Seatbelt variations](#)

[HyperPhysics\\*\\*\\*\\* Mechanics](#)

R.Nave

## Forces in Car Crashes

What force is required to stop the car in a distance of one foot? What force will be exerted on the driver? With and without seatbelt?



3200 lb automobile

Initial kinetic energy  $\frac{1}{2}mv^2$



Car collapses one foot upon impact.

Work required to stop the car  $F_{avg}d = -\frac{1}{2}mv^2$

[Force on car](#)

[Calculation of force on car](#)

[Example of force on driver](#)

[HyperPhysics\\*\\*\\*\\* Mechanics](#)

[Hyperphysics Website](#)

Hosted by: Georgia State University Department of Physics and Astronomy  
"Seatbelts" and "Car Crash Example" web pages displayed.

# Discussion

- Compared graphs of speed and damage assessment.
- Various methods of recording statistical data.
- Ways we could improve the experiment.
- Different strategies car designers use to make cars safer.

**“I can not thank you enough for the effort your team made to impress upon my students the importance of seatbelt safety.”—Mrs. Theresa Coffman**

**Tuckahoe Elementary Teacher**

# Special Thanks To

## **ComPADRE**

*Dave Donnelly, Lyle Barbato, & Matt Riggsbee*

## **American Institute of Physics**

*Jack Hehn & Jim Stith*

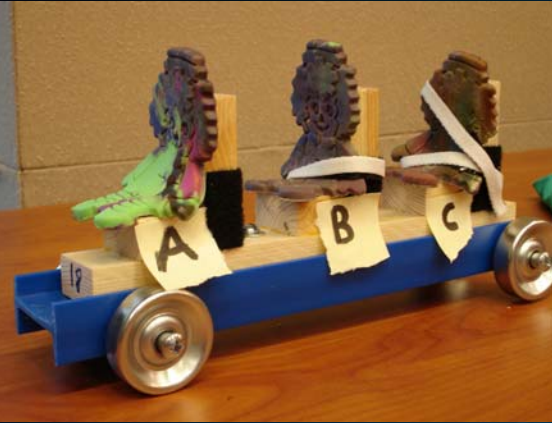
## **Society of Physics Students & AIP Education Division**

*Gary White, Liz Caron, Doug, Sonja, Stephanie, Tracy, Sacha,  
Lydia, Yvonne, & the rest of 2<sup>nd</sup> Floor.*

## **2007 Interns**

*Ryan, Meagan, Andy, Krystyna, Enrique, Andrea, Jesus, & Katie.*

# Let's Try It!



1. Strap in figures as shown.



2. Two people hold each end of spandex. Third person sets cart in place. Fourth person takes speed.



3. Use both hands on each side of the cart to pull back.

4. Pull back as far as you want keeping spandex taught.



Let it go!!!



5. Record the speed and assess the damage to the figures.