Playful Physics

by

David Weaver

Playful Physics

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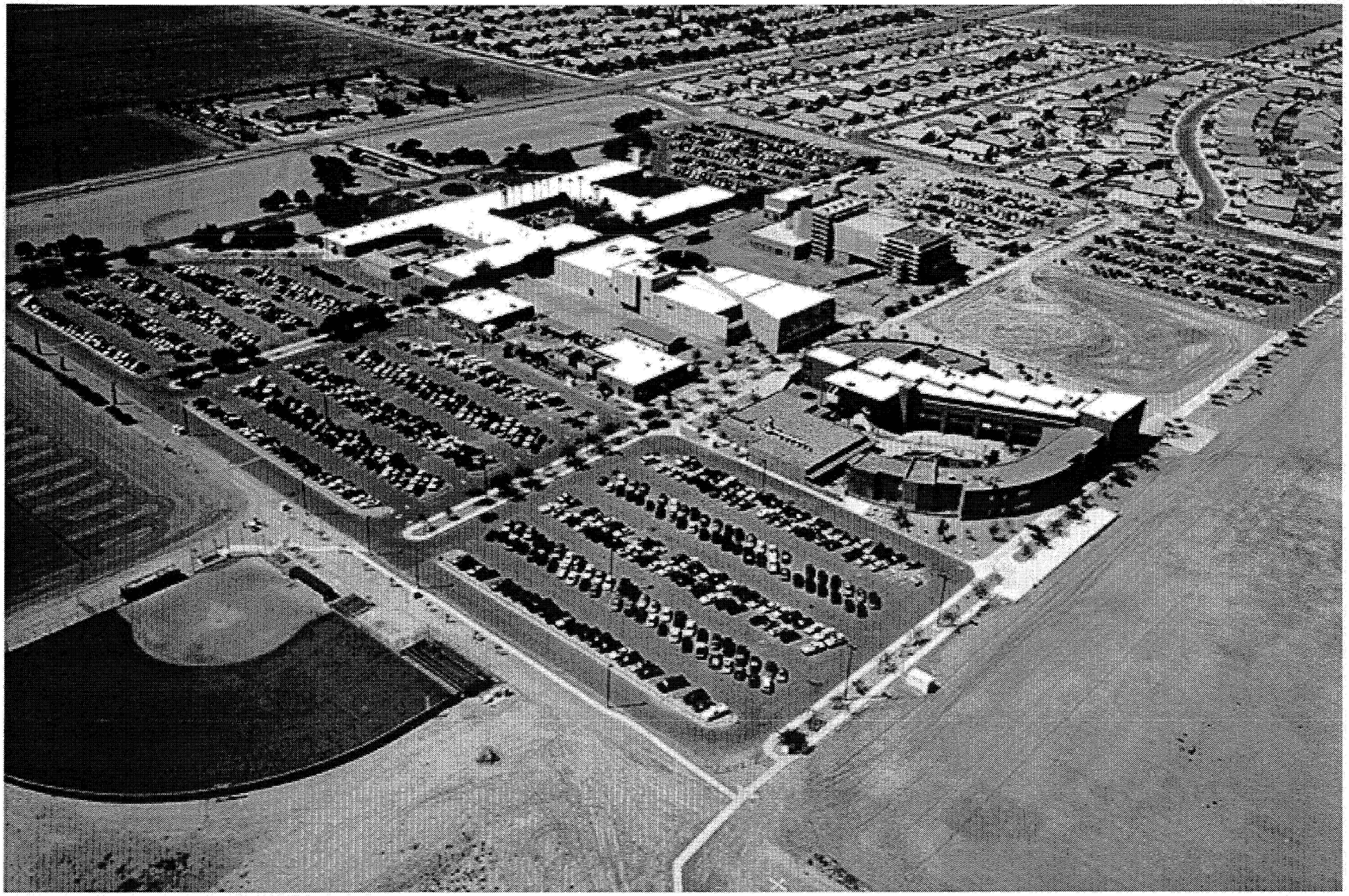
Playful Physics

- Context
- Simulation/Game Experience
- Sabbatical
- Summer Reading/Playing

Playful Physics



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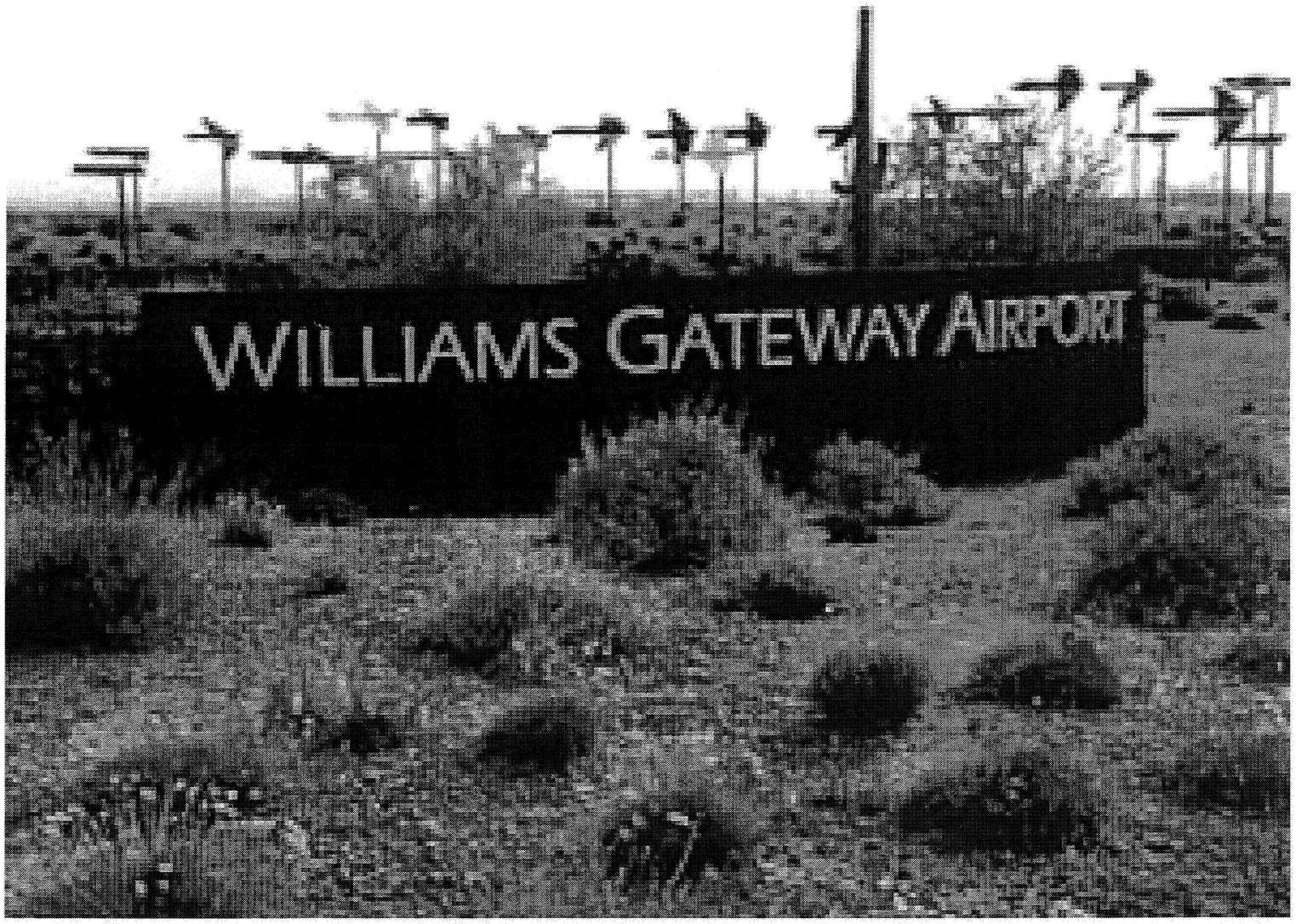

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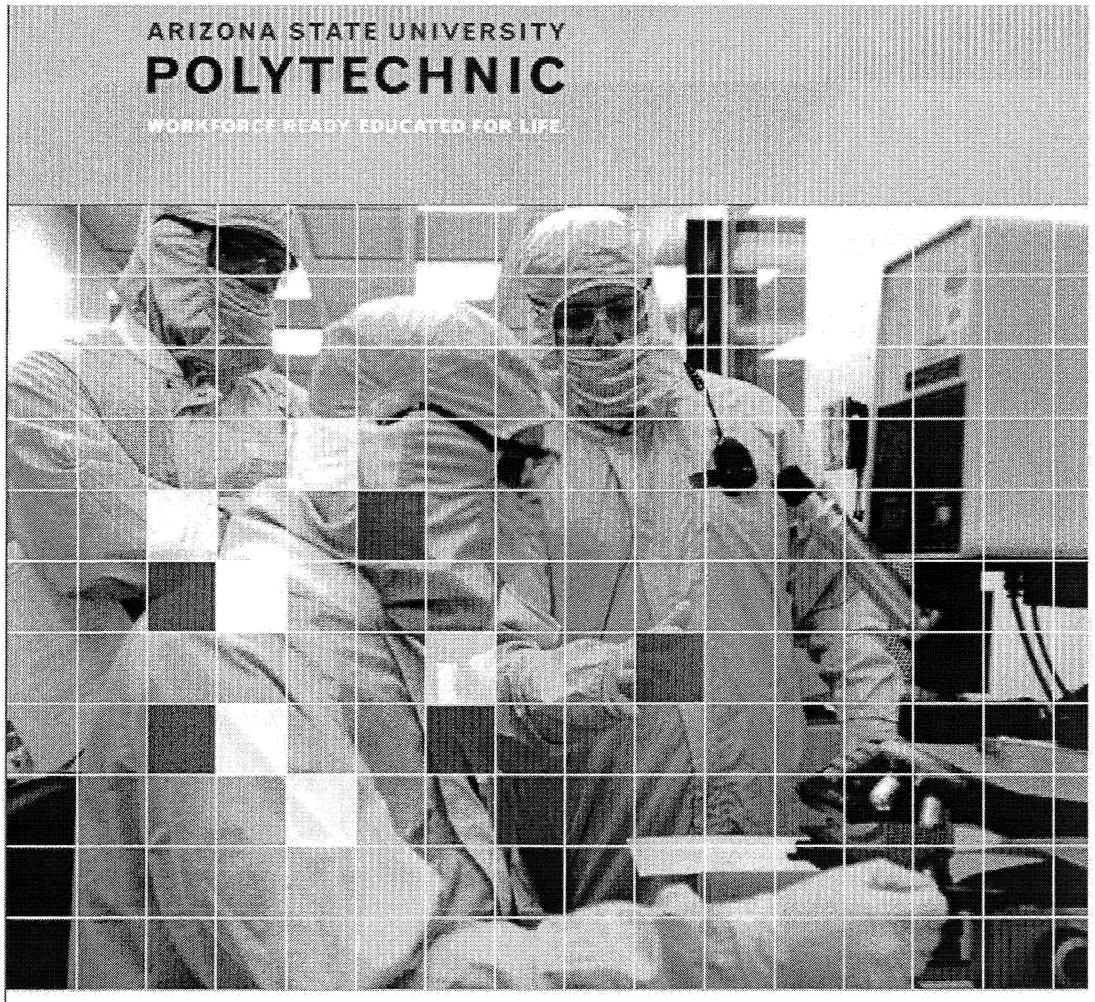

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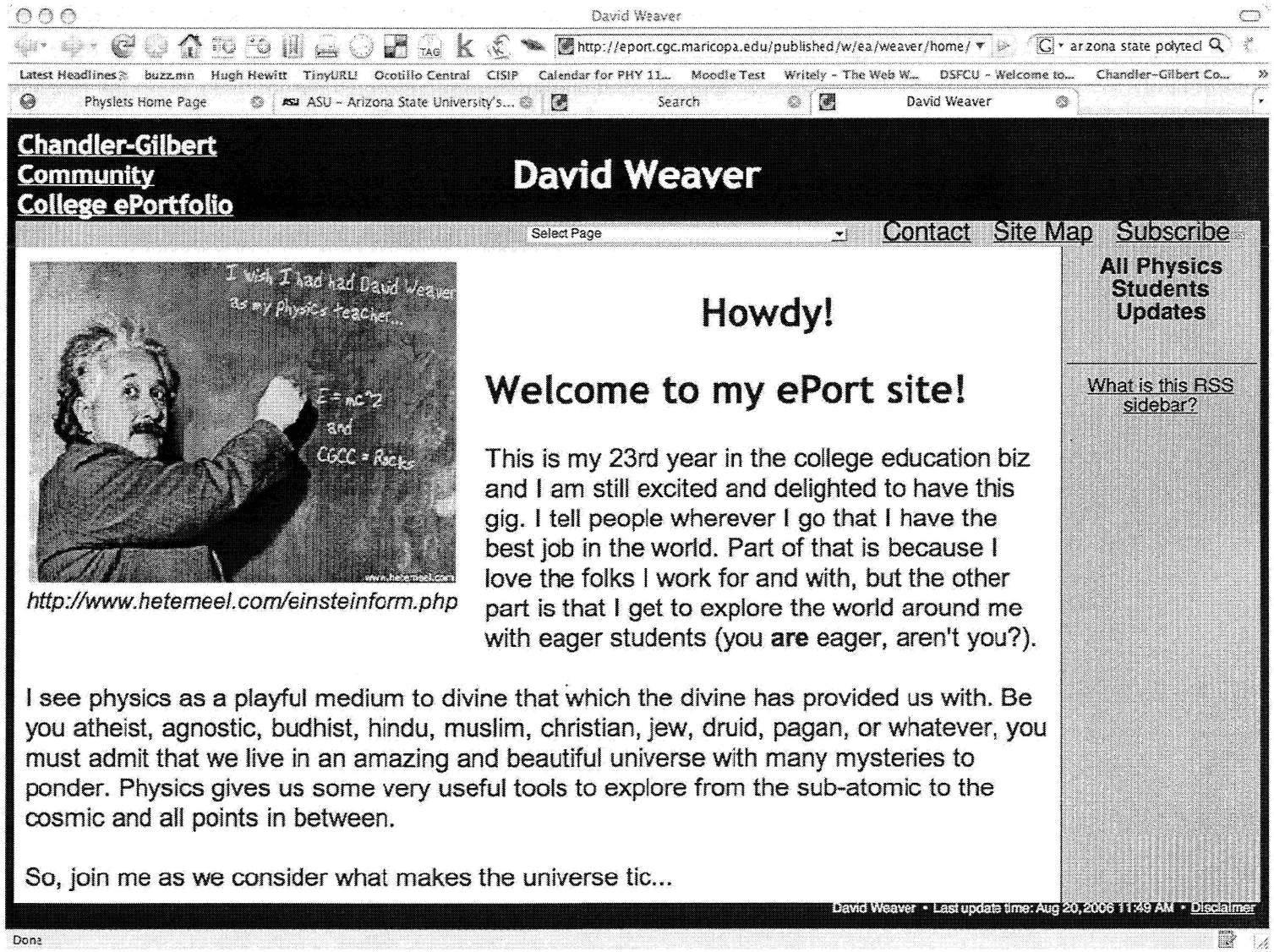

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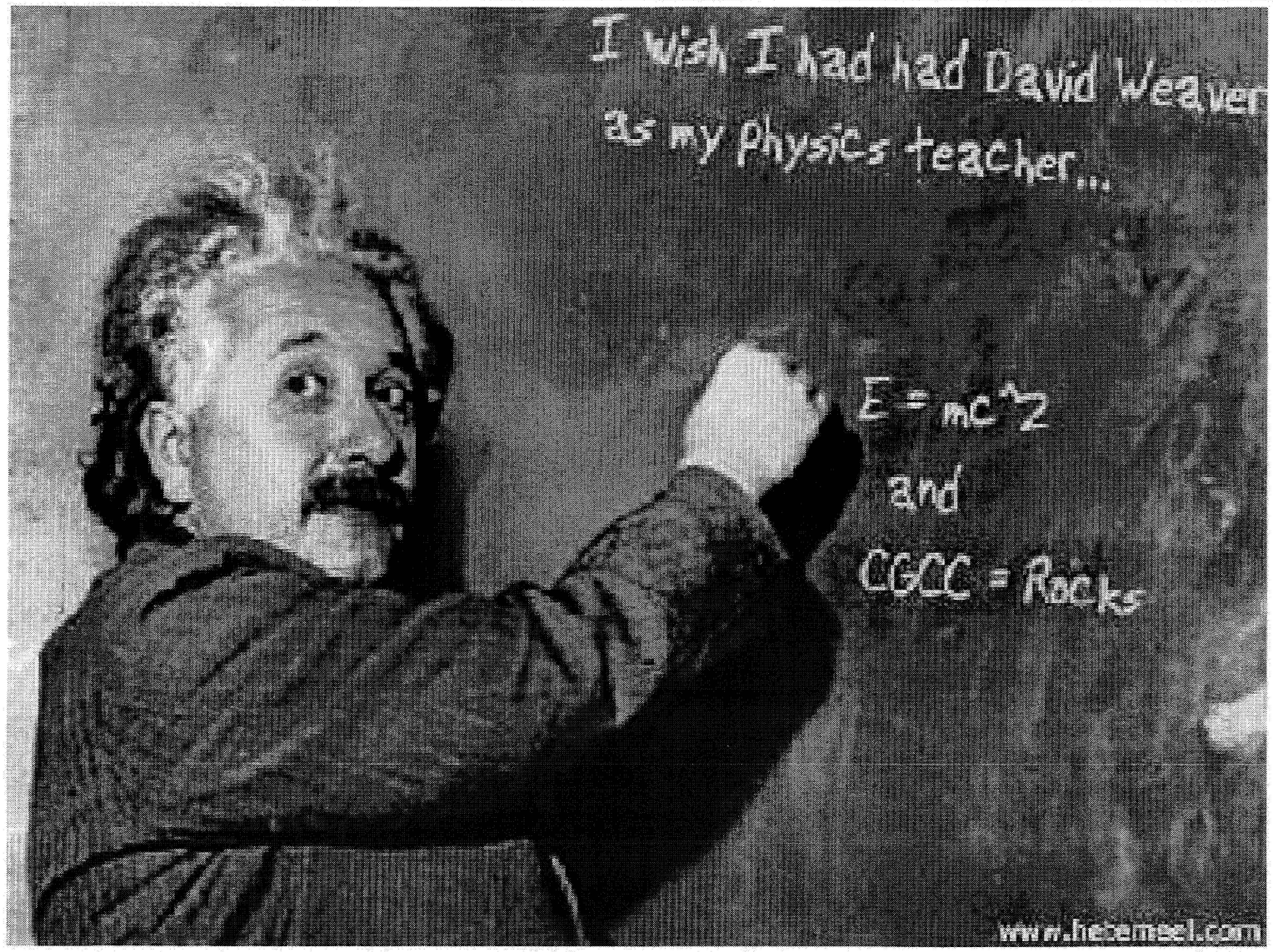

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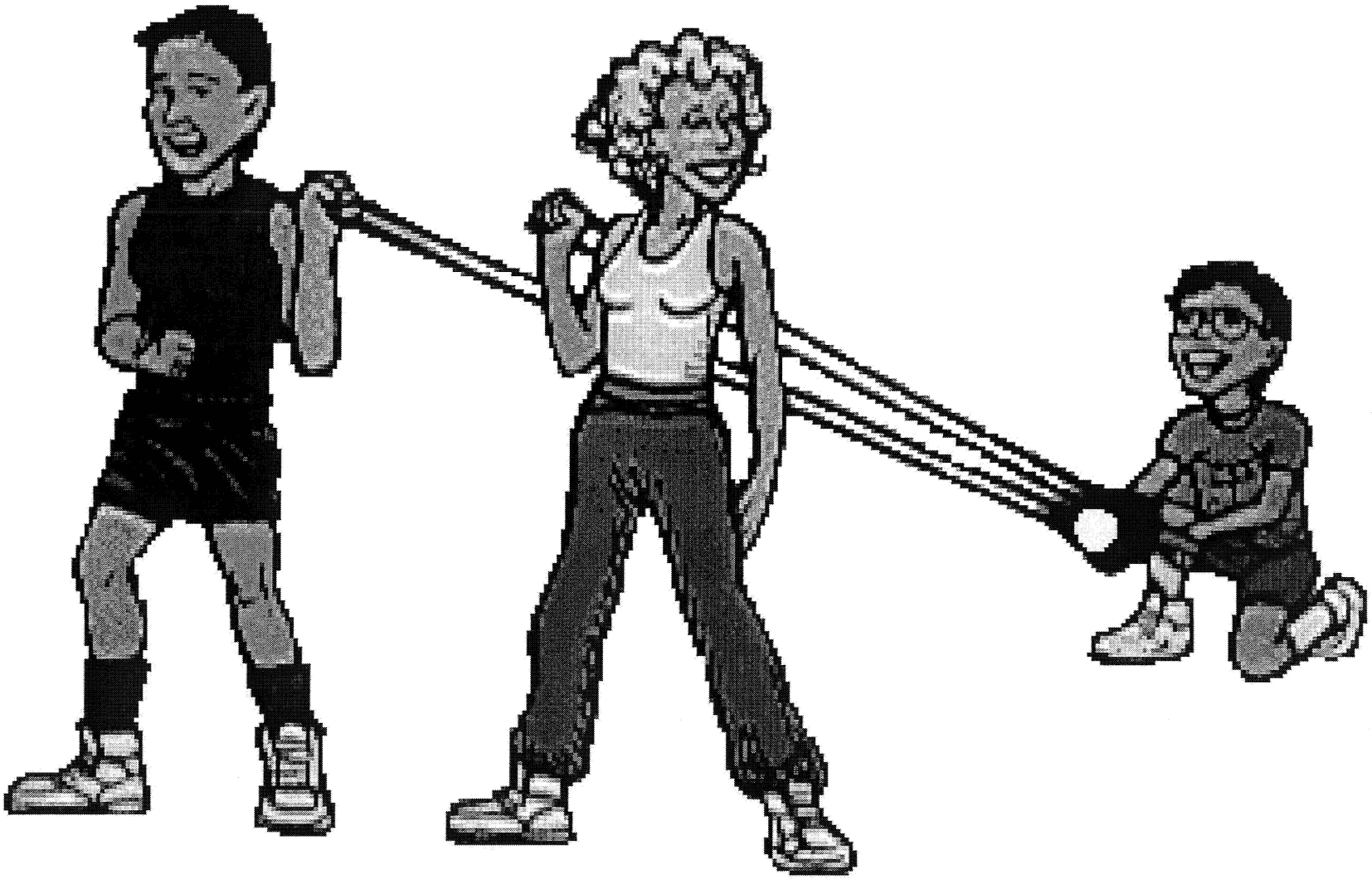

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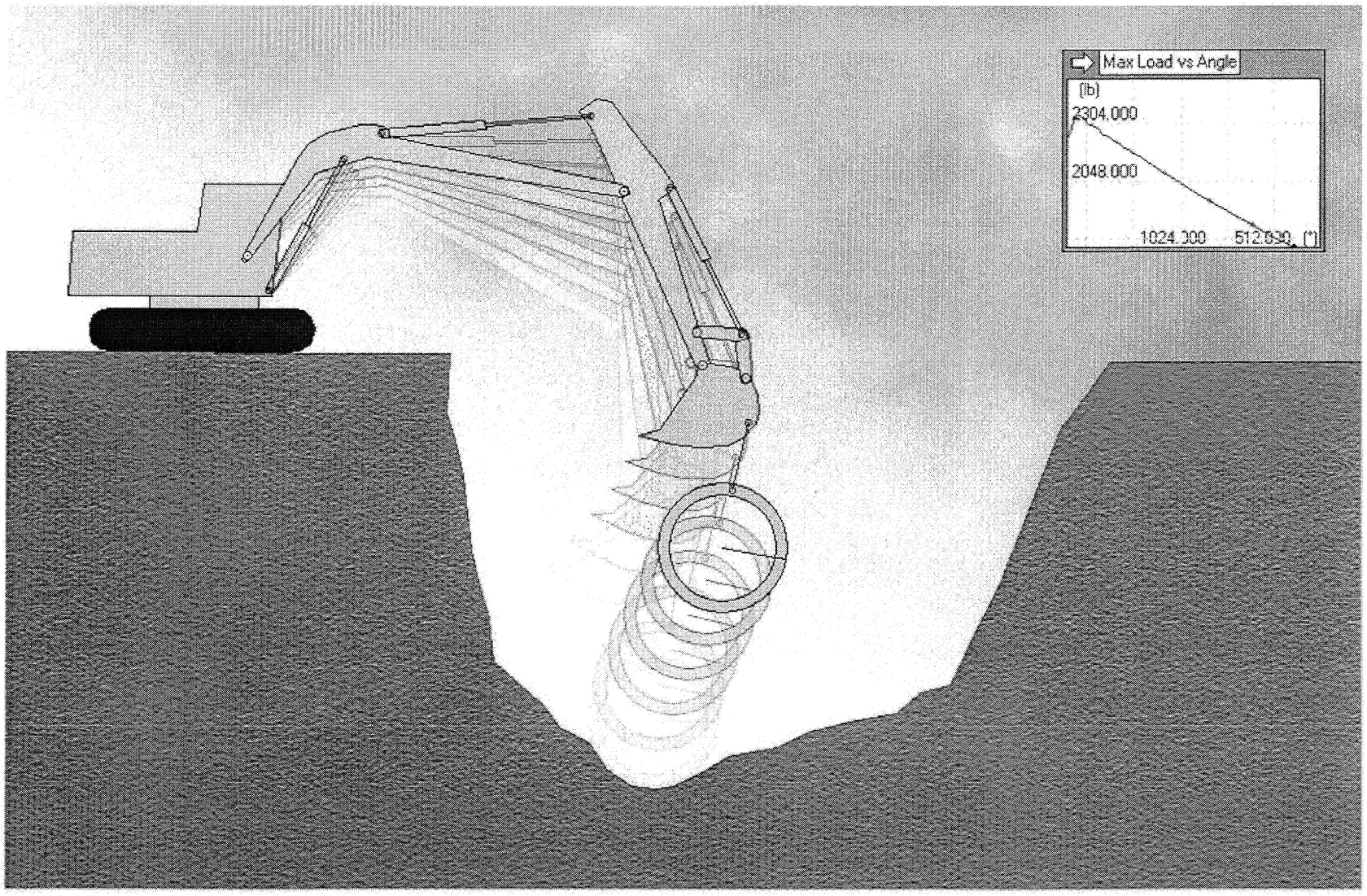
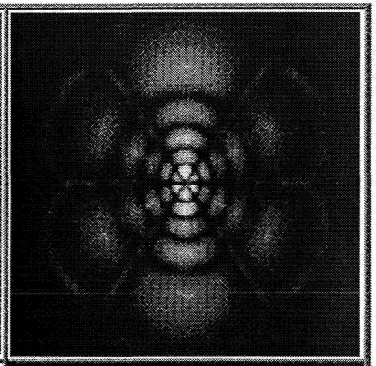


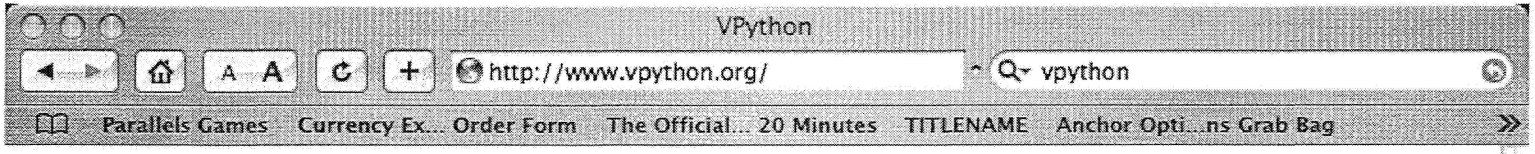
Playful Physics

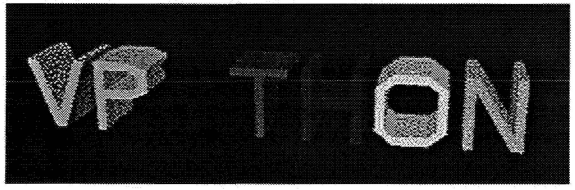
Physlets®



Welcome to the Physlets resource page. Physlets, **Ph**ysics App**lets**, are small flexible Java applets designed for science education. You do not need to become a Java expert in order to use Physlets. The links on the right contain tutorials, download instructions, and example problems to help you use Physlets in your teaching.

Playful Physics





3D Programming for Ordinary Mortals

HOME | DOWNLOADS | DOCUMENTATION

VPython is a package that includes:

- the Python programming language
- the IDLE interactive development environment
- "Visual", a Python module that offers real-time 3D output, and is easily usable by novice programmers
- "Numeric", a Python module for fast processing of arrays

VPython is free and open-source.

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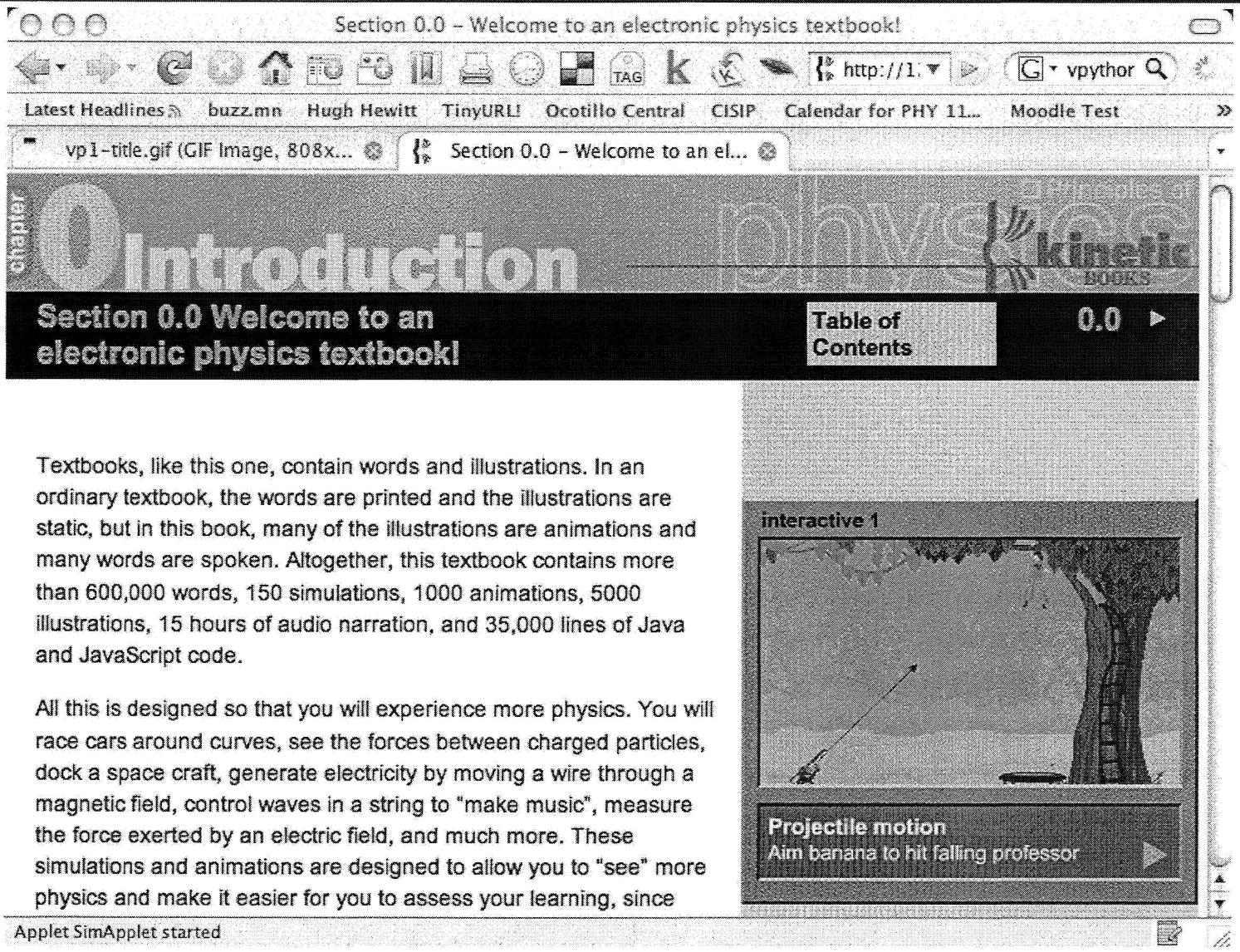

Playful Physics

I hereby request the granting of a sabbatical leave in order to develop curriculum materials that emphasize the connections between physics and digital games. Educational gaming is a burgeoning area of educational research (a Google search resulted in over 40 million hits), but a survey of recent MCCD sabbatical projects and of the Maricopa Learning Exchange suggest no local development yet. Sites like nobelprize.org contain games that teach about topics like LASERs and microscopes. Fermilab has the Fermilabyrinth which provides "A collection of Web-based games and activities to develop an understanding of the operations and experiments that take place in the Fermilab accelerator and detector halls and the scientific ideas they explore." The Department of Energy offers numerous simulations and games to teach about energy-related topics. A large number of colleges and universities have created myriad games and simulations to help students learn concepts in a playful way. However, there are few materials that make explicit the physics that drive many popular games (race/driving, football, soccer, etc.) and there currently is little in the way of materials showing students how to use tools like VPython and Interactive Physics to build simple games based on sound physics/mathematical models. I believe that students will learn more physics concepts and will be able to create more robust physics models of phenomena by studying the physics at work in their favorite digital games and by creating their own digital games.

Playful Physics

1. Effectively communicate qualitative and quantitative information orally and in writing.
2. Explain the application of fundamental physical principles to various physical phenomena.
3. Apply appropriate problem-solving techniques to practical and meaningful problems using graphical, mathematical, and written modeling tools.
4. Work effectively in collaborative groups.

Playful Physics

1. **Study game theory, digital game creation, and digital game design physics.** *Being informed as to the underlying theory, design techniques, and physics engine creation will greatly assist my analysis of existing games and design of materials to help students learn simple game creation.*
2. **Use the popularity of digital gaming as a motivational context within which to explore physics.** *A Kaiser Family Foundation study indicates that 83% of children ages 8-18 have video game consoles in their homes. A fundamental precept of Judo is to "ride the horse in the direction it is going," and most of students have spent many more hours with a gaming control in their hands than they have more "classical" physics applications.*

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3. **Create curricular materials that will allow students to analyze the physics engines in use in popular digital games.** *Popular games (car driving/racing, football, etc.) use physics engines (computer program modules responsible for making objects and characters appear to follow the laws of nature) to make the game action seem more realistic. However, some game actions appear to not strictly follow the physics models that apply to actual people and objects on Earth.*
4. **Create curricular materials that will guide students to use valid physics/mathematical models and software tools like VPython and Interactive Physics to build simple digital games.** *Both VPython and Interactive Physics are used to create physics demonstrations for students to view and/or interact with. By putting students in the role of game creator with these tools, they will likely learn far more physics.*

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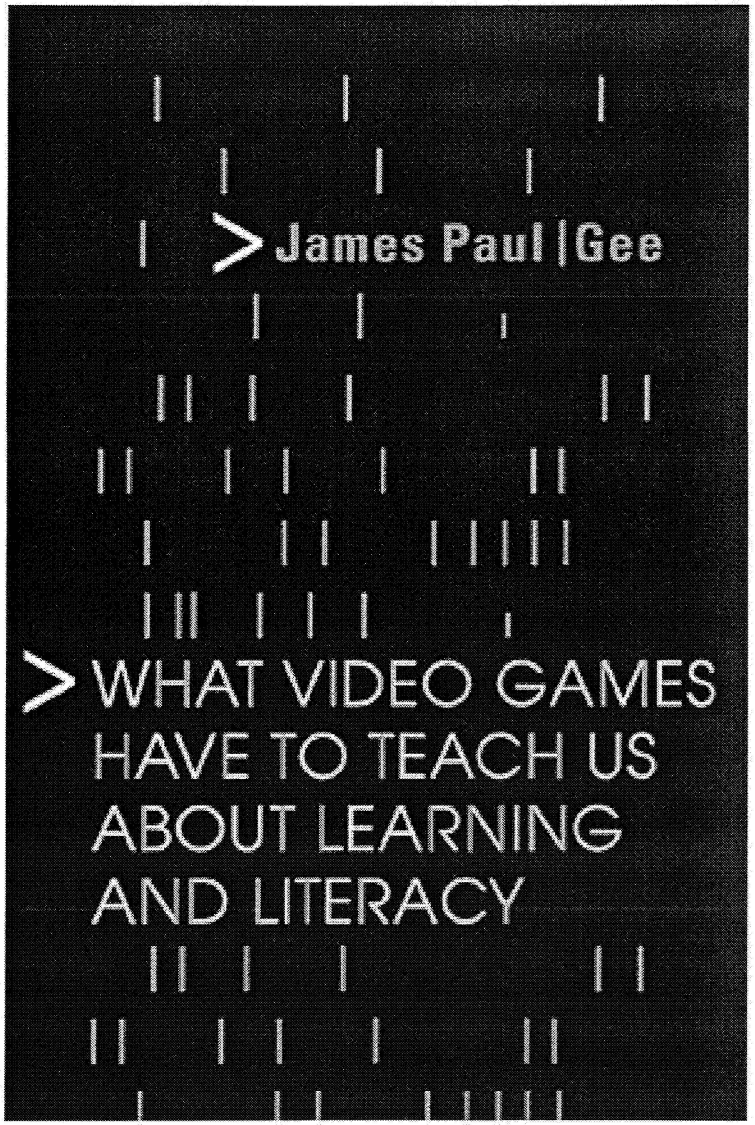

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IV. Professional Development Session

Scientific and Mathematical Knowledge Acquisition: Professional Development in Interactive Learning Environments