

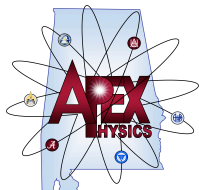
**Alliance For Physics Excellence (APEX)  
 2015 Summer Institute Workshop – Cohort 1  
 Physics Teacher Institute (PTI) Activity Schedule  
 Alabama A & M University**



**May 31 – June 12, 2015**

**Sunday, May 31, 2015**

6:00 - 6:15 PM	<input type="checkbox"/> Welcome/Greetings <input type="checkbox"/> Introductions <input type="checkbox"/> Announcements	Dr. Barbara Cady Alabama A & M University Announcements/Housekeeping	AAMU Ernest L. Knight Center- VIP Room
6:15 - 6:30 PM	<input type="checkbox"/> Welcome/Greetings	Dr. Mohan Aggarwal, Chairperson, AAMU Department of Physics, Chemistry and Mathematics	
6:30 - 7:00 PM	Buffet Dinner		
7:00 - 8:00 PM	<input type="checkbox"/> Waves and Geometric Optics Pre Content Assessment <input type="checkbox"/> Participants should bring a calculator	Eric Banilower & Kieth Esch Horizon Research, Inc.	



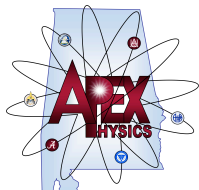
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**May 31 – June 12, 2015**

**Monday, June 1, 2015**

8:00 - 8:15 AM	Welcome/Greetings/Coffee Announcements	Mohan Aggarwal AA&MU and APEX Leadership Team
8:15 - 8:45 AM	<input type="checkbox"/> 1. <i>Wave Motion and Characteristics Part A</i> (Including discussion of participants exhibiting typical student responses.)	AAPT/PTRA for Jim Minstrell (1/2 hour)
8:45 - 9:30 AM	<input type="checkbox"/> Activity #1 & 5B (Waves in 1D): <i>Human Wave &amp; Energy Transfer</i>	AAPT/PTRA (3/4 hour)
9:30 - 9:45 AM	<input type="checkbox"/> Activity #2 (Waves in 1D): <i>Oscillations (Discuss only)</i>	AAPT/PTRA (1/4 hour)
9:45 - 10:30 AM	<input type="checkbox"/> Activity #6 (Waves in 1D): <i>Wave Speed with Fixed End Reflection</i>	AAPT/PTRA (3/4 hour)
10:30 – 11:15 AM	<input type="checkbox"/> Activity #5A & 7 (Waves in 1D): <i>Which Wave is Fastest? &amp; Effects of Amplitude and Media on Speed</i>	AAPT/PTRA (3/4 hour)
11:15 – 11:45 AM	<input type="checkbox"/> Activity #8 (Show) (Waves in 1D): <i>Effects of Amplitude and Media on Speed</i>	AAPT/PTRA (1/2 hour)
11:45 AM - Noon	<input type="checkbox"/> Activity #9 (Discuss only) (Waves in 1D): <i>Pace Yourself</i>	AAPT/PTRA (1/4 hour)
Noon - 1:00 PM	<input type="checkbox"/> Lunch (On Your Own)	
1:00 - 1:30 PM	<input type="checkbox"/> Activity #12 (Waves in 1D): <i>Standing Wave (Show YouTube, P 91 &amp; Discuss Question #4 P 90. Also show Walter Fendt Videos of superposition and standing waves.)</i>	AAPT/PTRA (1/2 hour)
1:30 - 3:00 PM	<input type="checkbox"/> Activity #10 (Waves in 1D): <i>Speed of a Wave &amp; Wave Equation</i>	AAPT/PTRA (1&1/2 hour)
3:00 - 4:30 PM	<input type="checkbox"/> Activity #17AJ (Waves in 1D): <i>Speed versus Tension &amp; Density of Medium via PASCO</i>	AAPT/PTRA (1&1/2 hour)
4:30 PM	Dinner (On Your Own)	



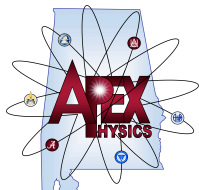
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**May 31 – June 12, 2015**

**Tuesday, June 2, 2015**

8:00 – 9:00 AM	<input type="checkbox"/> Activity #13 (Waves in 1D): <i>Speed of a Wave</i> Teachers discuss 4-step method	AAPT/PTRA (1 hour)
9:00 - 10:00 AM	<input type="checkbox"/> Activity #14 (Waves in 1D): <i>Wave Equation</i>	AAPT/PTRA (1 hour)
10:00 – 10:45 PM	<input type="checkbox"/> Activity #17B (Waves in 1D): Speed on a String versus Tension & Density of Wave Medium PhET	AAPT/PTRA (3/4 hour)
11:45 AM - Noon.	<input type="checkbox"/> Activity #18 (Waves in 1D): <i>Standing Waves</i>	AAPT/PTRA (1 hour)
Noon - 1:00 PM	Lunch (On Your Own)	
1:00 – 1:45 PM	<input type="checkbox"/> Activity #19 (Waves in 1D): <i>Standing Waves</i> Observe and answer questions.	AAPT/PTRA (3/4 hour)
1:45 - 2:00 PM	<input type="checkbox"/> Activity #22 (Waves in 1D): Family Physics with Microwave (Discuss Only)	AAPT/PTRA (1/4 hour)
2:00 - 2:15 PM	<input type="checkbox"/> Activity #23 (Waves in 1D): <i>Resonance and Coupled Oscillators</i> Set up and Discuss.	AAPT/PTRA (1/4 hour)
2:15 – 4:00 PM	<input type="checkbox"/> Activity #24J (Waves in 1D): <i>Waves Review</i>	AAPT/PTRA (1&3/4 hour)
4:00 - 4:30 PM	<input type="checkbox"/> 2. <i>Wave Motion and Characteristics Part B</i> (Including discussion of participants exhibiting typical student responses.)	Jim Minstrell (1/2 hour)
4:30 PM	Dinner (On Your Own)	



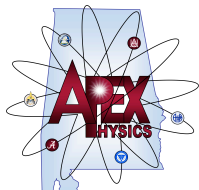
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**May 31 – June 12, 2015**

**Wednesday, June 3, 2015**

8:00 - 9:00 AM	<input type="checkbox"/> Activity #1 (Waves in Ripple Tank): <i>Pulses and Waves in a Ripple Tank</i>	AAPT/PTRA (1 hour)
9:00 - 10:00 AM	<input type="checkbox"/> Activity #2 (Waves in Ripple Tank): <i>Speed of Waves in a Ripple Tank</i>	AAPT/PTRA (1 hour)
10:00 - 11:00 AM	<input type="checkbox"/> Activity #3A (Waves in Ripple Tank): <i>Refraction of Water Waves</i>	AAPT/PTRA (1 hour)
11:00 AM - Noon.	<input type="checkbox"/> Start Activity #3C (Waves in Ripple Tank): <i>Refraction of Water Waves (PCC Version)</i>	AAPT/PTRA (1 hour)
Noon - 1:00 PM	Lunch (On Your Own)	
1:00 – 1:15 PM	<input type="checkbox"/> Finish Activity #3C (Waves in Ripple Tank): <i>Refraction of Water Waves (PCC Version)</i> Show Photographs of “Lenses”	AAPT/PTRA (1/2 hour)
1:15 - 2:20 PM	<input type="checkbox"/> Activity #3D (Waves in Ripple Tank): <i>Why Does Snell’s Law Work?</i>	AAPT/PTRA (1/2 hour)
2:20 – 2:55 PM	<input type="checkbox"/> Activity #11 (Waves in Ripple Tank): <i>Worksheet #1: Refraction of Waves</i>	AAPT/PTRA (1/2 hour)
2:55 - 3:55	<input type="checkbox"/> Activity #4 (Waves in Ripple Tank): <i>Diffraction and Interference or Waves in Ripple Tank</i>	AAPT/PTRA (1 hour)
3:55 – 4:30 PM	<input type="checkbox"/> Activity #5 (Waves in Ripple Tank): <i>Two point Interference Pattern</i>	AAPT/PTRA (1/2 hour)
4:30 PM	Dinner (On Your Own)	



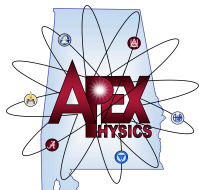
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**May 31 – June 12, 2015**

**Thursday, June 4, 2015**

8:00 – 8:20 AM	<input type="checkbox"/> Show Wave 2-Point interference Demonstration - File	AAPT/PTRA (1/2 hour)
8:20 – 9:25 AM	<input type="checkbox"/> Activity #12 (Waves in Ripple Tank): <i>Worksheet #1: Two point Interference</i>	AAPT/PTRA (1 hour)
9:25 - 10:30 AM	<input type="checkbox"/> Activity #6 (Waves in Ripple Tank): <i>Two point Interference in a Ripple Tank (PCC Version)</i>	AAPT/PTRA (1 hour)
10:30 - 11:40 AM	<input type="checkbox"/> Activity #8 (Waves in Ripple Tank): <i>Two Point Interference Patterns (Vernier Video Analysis Version)</i>	AAPT/PTRA (1 hour)
11:40 - Noon.	<input type="checkbox"/> Start Continue Activity #9 (Waves in Ripple Tank): <i>Doppler Effect (Vernier Video Analysis Version)</i>	AAPT/PTRA (1&1/2 hour)
<b>Noon - 1:00 PM</b>	<b>Lunch (On Your Own) --- 3. Diagnoser Wave Characteristics Set 1</b>	
1:00 - 2:15 PM	<input type="checkbox"/> Continue Activity #9 (Waves in Ripple Tank): <i>Doppler Effect (Vernier Video Analysis Version)</i>	AAPT/PTRA (1&1/2 hour)
2:15 - 3:20 PM	<input type="checkbox"/> Activity #10 (Waves in Ripple Tank): <i>Doppler Effect Worksheet</i>	AAPT/PTRA (1 hour)
3:20 - 4:10 PM	<input type="checkbox"/> Activity #13 (Waves in Ripple Tank): <i>Drawing an Interference Pattern</i>	AAPT/PTRA (3/4 hour)
4:10 – 4:30	<input type="checkbox"/> Activity #1 (Geometric Optics): <i>Story of Blind Man</i> - Refer to TPT Article page 25 and Intro pages 5-7	AAPT/PTRA (1/4 hour)
<b>4:30 PM</b>	<b>Dinner (On Your Own) – 3. Complete Diagnoser Wave Characteristics Set 1</b>	



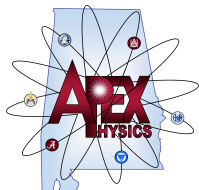
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**May 31 – June 12, 2015**

**Friday, June 5, 2015**

8:00 – 8:40 AM	<input type="checkbox"/> Activity #2 (Geometric Optics): <i>Sources of Light</i>	AAPT/PTRA (1/2 hour)
8:40 – 9:50 AM	<input type="checkbox"/> Activity #3 (Geometric Optics): <i>Properties of Light - Pinhole "Image"</i>	AAPT/PTRA (1 hour)
9:50 – 10:55 AM	<input type="checkbox"/> Activity #4 (Geometric Optics): <i>Light Shadows</i>	AAPT/PTRA (1 hour)
10:55 AM - Noon.	<input type="checkbox"/> Activity #5 (Geometric Optics): <i>Phases of the Moon</i>	AAPT/PTRA (1 hour)
Noon - 1:00 PM	Lunch (On Your Own)	
1:00 - 1:30 PM	<input type="checkbox"/> Continue Activity #6 (Geometric Optics): <i>Using Rainbow Glasses</i>	AAPT/PTRA (1/2 hour)
1:30 - 2:00 PM	<input type="checkbox"/> Start Activity #8 (Geometric Optics): <i>Photometric Terms</i>	AAPT/PTRA (1/2 hour)



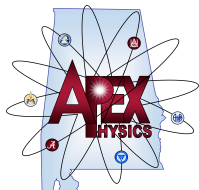
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**May 31 – June 12, 2015**

**Monday June 8, 2015**

8:00 – 9:10 AM	<input type="checkbox"/> Continue Activity #8 (Geometric Optics): <i>Luminance versus Distance</i> (PASCO)	AAPT/PTRA (1&1/4 hour)
9:10 – 10:10 AM	<input type="checkbox"/> Activity #9 (Geometric Optics): Practice Problems on Shadows and Illuminance	AAPT/PTRA (1 hour)
10:10 – 11:45 AM	<input type="checkbox"/> Activity #10 (Geometric Optics): <i>Making a Paraffin Wax Photometer and Measuring the Luminous Intensity of the Sun</i> Take data over week-end	AAPT/PTRA (1&1/2 hour)
11:45 AM - Noon.	<input type="checkbox"/> Start Continue Activity #11 (Geometric Optics): Objects, Flat Mirrors, and Properties of Images	AAPT/PTRA (1&1/2 hour)
Noon - 1:00 PM	Lunch (On Your Own)	
1:00 - 2:20 PM	<input type="checkbox"/> Continue Activity #11 (Geometric Optics): Objects, Flat Mirrors, and Properties of Images	AAPT/PTRA (1&1/2 hour)
2:20 - 3:55 PM	<input type="checkbox"/> Activity #12 (Geometric Optics): Reflection of Light from a Flat Mirror	AAPT/PTRA (1&1/2 hour)
3:55 – 4:30 PM	<input type="checkbox"/> Start Activity #13 (Geometric Optics): Reflection of Light from Multiple Flat Mirrors	AAPT/PTRA (1&1/2 hour)
4:30 PM	Dinner (On Your Own)	



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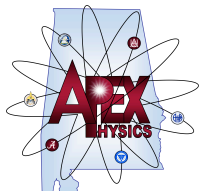


**May 31 – June 12, 2015**

**Tuesday June 9, 2015**

8:00 – 9:00 AM	<input type="checkbox"/> Action Research as a Necessary Tool for Change	Dennis Sunal
9:00 – 10:00 AM	<input type="checkbox"/> APEX Program Data	Dennis Sunal & JW Harrell
10:00 – 11:00 AM	<input type="checkbox"/> Developing Expertise in Assessing Inquiry	Marilyn Stephens & Dennis Sunal
11:00 – Noon	<input type="checkbox"/> Continue Activity #13 (Geometric Optics): Reflection of Light from Multiple Flat Mirrors	AAPT/PTRA (1&1/2 hour)
Noon – 1:00 PM	Lunch (On Your Own) --- 4. Diagnoser Reflect & Refract Set 1	
1:00 – 1:25	<input type="checkbox"/> Activity #14 (Geometric Optics): Set up a couple of demonstrations and/or displays (e.g., OBJECT, IMAGE, and TEST signs, Pepper's "ghost", Draw your Face, Optical Lever, Periscope, etc.)	AAPT/PTRA (1/2 hour)
1:25 – 2:30 PM	<input type="checkbox"/> Activity #15 (Geometric Optics): Sample test on Reflection and Flat Mirrors	AAPT/PTRA (1 hour)
3:30 – 4:00 PM	<input type="checkbox"/> Start Activity #17 (Geometric Optics): Properties of Images Formed by a Concave/Convex Mirrors	AAPT/PTRA (1&1/2 hour)
4:00 – 5:30 PM	<input type="checkbox"/> 5. Designing or Choosing Activities to Address Misconceptions as well as Learning Goals	Jim Minstrell, Facet Innovations (1 ½ hours)
5:30 PM	Dinner (On Your Own) Complete --- 4. Diagnoser Reflect & Refract Set 1	





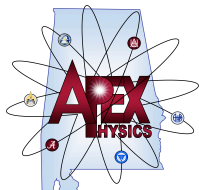
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**May 31 – June 12, 2015**

**Wednesday, June 10, 2015**

8:00 - 9:15 AM	<input type="checkbox"/> Continue Activity #17 (Geometric Optics): Properties of Images Formed by a Concave/Convex Mirrors	AAPT/PTRA (1&1/2 hour)
9:15 - 9:50 AM	<input type="checkbox"/> Activity #18A (Geometric Optics): Family Physics – Concave Mirror	AAPT/PTRA (1/2 hour)
9:50 - 10:25 AM	<input type="checkbox"/> Activity #18B (Geometric Optics): Using Ray Drawing Diagrams for Curved Mirrors	AAPT/PTRA (1/2 hour)
10:25 AM - Noon.	<input type="checkbox"/> Activity #19 (Geometric Optics): Worksheet on Reflection and Mirrors	AAPT/PTRA (1&1/2 hour)
Noon - 1:00 PM	Lunch (On Your Own)	
1:00 - 2:30 PM	<input type="checkbox"/> Activity #21 (Geometric Optics): Refraction of Light (Liquids)	AAPT/PTRA (1&1/2 hour)
2:30 – 2:55 PM	<input type="checkbox"/> Activity #22A (Geometric Optics): Fish Tank Demonstration of Refraction	AAPT/PTRA (1/2 hour)
2:55 - 4:30 PM	<input type="checkbox"/> Activity #24 (Geometric Optics): Refraction of Light through Solids	AAPT/PTRA (1&1/2 hour)
4:30 PM	Dinner (On Your Own)	



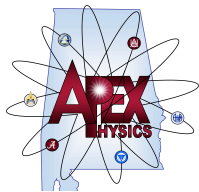
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**May 31 – June 12, 2015**

**Thursday, June 11, 2015**

8:00 – 8:20 AM	<input type="checkbox"/> Activity #25 (Geometric Optics): Refraction Demonstrations (e.g., Disappearing Solution, Uranium OXIDE puzzle, Apparent Depth, Rotating Porro Prism, etc.)	AAPT/PTRA (1/4 hour)
8:20 – 9:55 AM	<input type="checkbox"/> Activity #27 (Geometric Optics): Properties of Images Formed by a Converging Lens	AAPT/PTRA (1&1/2 hour)
9:55 - 11:00 AM	<input type="checkbox"/> Activity #28 (Geometric Optics): Mammalian Eye ... An Application of a Lens System	AAPT/PTRA (1 hour)
11:00 – Noon	<input type="checkbox"/> Start Activity #29A (Geometric Optics): Introduction to Properties of Images Formed by a Diverging Lens	AAPT/PTRA (1 1/2 hour)
Noon - 1:00 PM	Lunch (On Your Own) --- 6. Diagnoser Wave Speed Set 1	
1:00 – 1:20 PM	<input type="checkbox"/> Continue Activity #29A (Geometric Optics): Introduction to Properties of Images Formed by a Diverging Lens	AAPT/PTRA (1 1/2 hour)
1:20 - 2:25 PM	<input type="checkbox"/> Activity #30 (Geometric Optics): Principal Rays for a Converging Lens	AAPT/PTRA (1 hour)
2:25 – 4:00 PM	<input type="checkbox"/> Activity #31 (Geometric Optics): Worksheet on Refraction and Lenses	AAPT/PTRA (1&1/2 hour)
4:00 – 5:30 PM	<input type="checkbox"/> 7 Collecting Data for Action Research, Using Diagnoser	Jim Minstrell, Facet Innovations (1& 1/2 hours)
5:30 PM	Dinner (On Your Own) Complete --- 6. Diagnoser Wave Speed Set 1	



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**May 31 – June 12, 2015**

**Friday, June 12, 2015**

8:00 – 9:00 AM	<input type="checkbox"/> Activity #32 (Geometric Optics): Demonstrations Using A Dissectible Lens	AAPT/PTRA (1 hour)
9:00 - 10:00 AM	<input type="checkbox"/> Activity #35 (Geometric Optics): Beer-Lambert's Law of Absorption	AAPT/PTRA (1 hour)
10:00 - 11:00 AM	<input type="checkbox"/> Activity #36 (Geometric Optics): Efficiency of Various Light Bulbs	AAPT/PTRA (1 hour)
11:00 AM - Noon.	<input type="checkbox"/> Activity #37 (Geometric Optics): Microwave and Speed of Light	AAPT/PTRA (1 hour)
Noon - 1:00 PM	In house Lunch	
1:00 – 2:00 PM	<input type="checkbox"/> Waves and Geometric Optics Post Content Assessment	Eric Banilower & Kieth Esch Horizon Research, Inc.