Alliance for Physics Excellence (APEX)
2017 Summer Institute Workshop – Cohort 3
Physics Teacher Institute (PTI) Activity Schedule
Alabama A & M University

June 4 – June 16, 2017

Sunday, June 4, 2017

5:00 - 5:15 PM	❑ **Welcome/Greetings** ❑ **Introductions** ❑ **Announcements**	**Dr. Barbara Cady** **Alabama A & M University** **Announcements/Housekeeping (15 minutes)**	**AAMU Ernest L. Knight Center- VIP Room**
5:15 - 5:30 PM	❑ **Welcome/Greetings**	**Dr. Mohan Aggarwal, Chairperson,** **AAMU Department of Physics, Chemistry and Mathematics (15 minutes)**	
5:30 - 6:30 PM	❑ **Waves and Geometric Optics Pre Content Assessment** ❑ **Participants should bring a calculator**	**Eric Banilower & Kieth Esch** **Horizon Research, Inc.**	
6:30 - 7:15 PM	**Buffet Dinner**		
7:15 - 8:00 PM	❑ **Eliciting Key Ideas in Waves**	**Jim Minstrell, Facet Innovations (45 minutes)**	

1 ¾ hours

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Monday, June 5, 2017

8:00 - 8:15 AM	**Welcome/Greetings/Coffee Announcements**	**Mohan Aggarwal AA&MU and APEX Leadership Team**
8:15 - 9:00 AM	❑ **Waves Activity #1: *Human Wave* (Page 19).**	**AAPT/PTRA (3/4 hour)**
9:00 - 9:15 AM	❑ **Waves Activity #2: *Simple Oscillations* (Discuss Only, Page 23)**	**AAPT/PTRA (1/4 hour)**
9:15 - 10:30 AM	❑ **Waves Activity #3A: *Estimate the Speed of a Transverse Wave* (Page 31)**	**AAPT/PTRA (1 1/4 hour)**
10:30 - Noon	❑ **Waves Activity #4: *Speed of Transverse Wave Pulse (Without Reflection)* (Vernier Video, Page 35)**	**AAPT/PTRA (1 1/2 hour)**
Noon - 1:00 PM	**Lunch (On Your Own)**	
1:00 - 1:45 PM	❑ **Waves Activity #5: *Wave at Me* (Page 41)**	**AAPT/PTRA (3/4 hour)**
1:45 - 2:45 PM	❑ **Waves Activity #6A: *Energy Transfer & Earthquake Waves* (YouTube, Page 51)**	**AAPT/PTRA (1 hour)**
2:45 - 4:45 PM	❑ **Waves Activity #8: *Effects of Amplitude and Media on Speed* (Page 61)** ❑ **Demonstration with Shive Machine (Page 65)**	**AAPT/PTRA (2 hours)**
4:45 - 5:00 PM	❑ **Waves Activity #7: Song, "*Oh! How, …?*" (Page 59)**	**AAPT/PTRA (1/4 hour)**
5:00 PM	**Dinner (On Your Own – Homework: Determine the broadcast frequency of a local Radio Station)**	

7 ¾ hours

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Tuesday, June 6, 2017

8:00 - 9:15 AM	❑ **Waves Activity #9A: *Effect of Amplitude and Media on Speed, PSSC* (Page 81)**	**AAPT/PTRA (1 1/4 hour)**
9:15 - 10:30 AM	❑ **Waves Activity #11: *Using a Wave Simulation to Determine a Relationship, PhET* (Page 91)**	**AAPT/PTRA (1 1/4 hour)**
10:30 - Noon	❑ **Waves Activity #13: *Relating Frequency, Wavelength and Speed using Standing Wave* (Page 103)**	**AAPT/PTRA (1 1/2 hour)**
Noon - 1:00 PM	**Lunch (On Your Own)**	
1:00 - 1:45 PM	❑ **Jim Minstrell**	**Facet Innovations (3/4 hour)**
1:45 - 3:15 PM	❑ **Wave Activity #14: *Speed versus Tension & Density of Medium, PASCO, ASIM* (Page 113)** **OR** ❑ **Wave Activity #15: *Speed of a Wave in a String … Interactive Video* by Peter Bohacek (Page 123)**	**AAPT/PTRA (2 hours)**
3:15 - 5:15 PM	❑ **Waves Activity #18: *Speed of a Pulse (Three Ways)* (Page 153)**	**AAPT/PTRA (1 1/2 hours)**
5:15 PM	**Dinner (On Your Own)**	

8 ¼ hours

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Wednesday, June 7, 2017

8:00 – 8:30 AM	❑ **Waves Activity #18: *Speed of a Pulse (Three Ways)* (Page 153) Whiteboard**	**AAPT/PTRA (1/2 hour)**
8:30 – 9:15 AM	❑ **Waves Activity #21: Song, "*Where is wavelet? …*" (Page 175)** ❑ **Show "*String Thing*" (Page 229)** ❑ **Waves Activity #28: *Family Physics - Radio* (Page 207)**	**AAPT/PTRA (3/4 hour)**
9:15 - 10:15 AM	❑ **Do as a group… Waves Activity #26: *Reflection and Interference of Pulses.* (Page 191)**	**AAPT/PTRA (1 hour)**
10:15 - 11:45 AM	❑ **Activity #1 (Waves in Ripple Tank): *Pulses and Waves in a Ripple Tank* (Page 23)**	**AAPT/PTRA (1 1/2 hour)**
11:45 - Noon	❑ **Start Activity #2 (Waves in Ripple Tank): *Speed of Waves in a Ripple Tank* (Page 31) If you are using the video, use the top waves found at about 9 minutes 27 seconds.**	**AAPT/PTRA (1/4 hour)**
Noon - 1:00 PM	**Lunch (On Your Own)**	
1:00 – 2:15 PM.	❑ **Finish Activity #2 (Waves in Ripple Tank): *Speed of Waves in a Ripple Tank* (Page 31) If you are using the video, use the top waves found at about 9 minutes 27 seconds.**	**AAPT/PTRA (1 1/4 hour)**
2:15 - 3:30 PM	❑ **Activity #3C (Waves in Ripple Tank): *Refraction of Water Waves* (Page 41) All tables do Diagrams 2 and 5. Divide Diagrams 3, 4, 8, and 9 among tables.** ❑ **Show Photographs of "Lenses"**	**AAPT/PTRA (1 1/4 hour)**
3:30 - 4:30 PM	❑ **Activity #3D (Waves in Ripple Tank): *Why Does Snell's Law Work?* (Page 49) A look at the mathematics of refraction of waves.**	**AAPT/PTRA (1 hour)**
4:30- 5:00 PM	❑ **Activity #12 (Waves in Ripple Tank): Worksheet #1 Waves in Ripple Tank (Page 113)** ❑ **Discuss/Start only – complete for homework.**	**AAPT/PTRA (1/2 hour)**
5:00 PM	**Dinner (On Your Own) Homework: Finish Activity #12, Worksheet #1 (Page 113) and look at Waves Activity #26: *Reflection and Interference of Pulses*. (Waves, Page 191)**	

8 hours

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Thursday, June 8, 2017

8:00 - 8:45 AM	❑ **White Board Worksheet #1 (Waves in Ripple Tank): *Refraction of Waves* (Page 113)**	**AAPT/PTRA (3/4 hour)**
8:45 - 10:00 AM	❑ **Activity #4 (Waves in Ripple Tank): *Diffraction and Interference or Waves in Ripple Tank* (Page 53)**	**AAPT/PTRA (1 1/4 hour)**
10:00 - 11:15 AM	❑ **Activity #5 (Waves in Ripple Tank): *Two point Interference Pattern* (Page 57)**	**AAPT/PTRA (1 1/4 hour)**
11:15 – 11:45 AM	❑ **Show Wave 2-Point interference Demonstration – File (Transparencies) (Page 157)** ❑ **Show Point Arc (Page 64)**	**AAPT/PTRA (1/2 hour)**
11:45 - Noon	❑ **Start Worksheet #2 (Waves in Ripple Tank): *Two point Interference* (Page 117)**	**AAPT/PTRA (1/4 hour)**
Noon - 1:00 PM	**Lunch (On Your Own)**	
1:00 – 2:00 PM	❑ **Jim Minstrell**	**Facet Innovations (1 hour)**
2:00 - 2:45 PM	❑ **Finish Worksheet #2 (Waves in Ripple Tank): *Two point Interference* (Page 117)**	**AAPT/PTRA (3/4 hour)**
2:45 - 4:00 PM	❑ **Activity #8 (Waves in Ripple Tank): Speed of Wave in ripple tank *(Vernier Video Analysis Version (Stationary Source)* (Page 81)**	**AAPT/PTRA (1 1/4 hour)**
4:00 - 5:15 PM	❑ **Activity #9 (Waves in Ripple Tank): *Doppler Effect (Vernier Video Analysis Version* (Page 87) *(Moving Source)***	**AAPT/PTRA (1 1/4 hour)**
5:15 PM	**Dinner (On Your Own) Homework Look at Activity #10 (Page 101):** **Do Activity #11 (Waves in Ripple Tank) *Waves Review Worksheet* (Page 105)**	

8 ¼ hours

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Friday, June 9, 2017

8:00 – 8:45 AM	❑ **Discuss… Whiteboard Homework: Activity #11 (Waves in Ripple Tank): *Waves Review Worksheet* (Page 105)**	**AAPT/PTRA (3/4 hour)**
8:45 – 9:30 AM	❑ **Activity #1 (Geometric Optics): *Story of Blind Man* (Page 25)** ❑ **Refer to TPT *Story of Blind Man* Article (Page 27)** ❑ **Also refer to Intro D, Maria & Jessica (Page 6)** ❑	**AAPT/PTRA (3/4 hour)**
9:30 –10:00 AM	❑ **Activity #2 (Geometric Optics): *Sources of Light* - Discussion (Page 29)**	**AAPT/PTRA (1/2 hour)**
10:00 –11:00 AM	❑ **Activity #3 (Geometric Optics): *Properties of Light - Pinhole "Image"* (Page 37) …Whiteboard on Monday AM**	**AAPT/PTRA (1 hour)**
11:00 - Noon	❑ ***Building Expertise through Reflection: What Change Can you Expect?***	**Dennis Sunal (1 hour)**
Noon - 1:00 PM	**Lunch (On Your Own)**	**Noon - 1:00 PM**
1:00 – 1:30 PM	❑ ***Comparing APEX Classrooms with other Physics Classrooms in Alabama: What Can We Learn?***	**Tara Ray**
1:30 - 2:00 PM	❑ ***Comparing APEX AP Classrooms with other AP Physics Classrooms in Alabama: What Can We Learn?***	**Justina Ogodo**

5 hours

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Monday June 12, 2017

8:00 – 8:30 AM	❑ **Discuss/Whiteboard Activity #3 (Geometric Optics): *Properties of Light - Pinhole "Image"* (Page 37)**	**AAPT/PTRA (1/2 hour)**
8:30 – 9:45 AM	❑ **Activity #4 (Geometric Optics): *Light Shadows* (Page 45)**	**AAPT/PTRA (1 1/4 hour)**
9:45 AM – 11:15	❑ **Activity #5 (Geometric Optics): *Phases of the Moon* (Page 61)**	**AAPT/PTRA (1 1/2 hour)**
11:15 AM – Noon	❑ **Activity #8 (Geometric Optics): *Practice Problems on Shadows and Illuminance* (Page 87)**	**AAPT/PTRA (3/4 hour)**
Noon - 1:00 PM	**Lunch (On Your Own)**	**Noon - 1:00 PM**
1:00 - 2:30 PM	❑ **Activity #9 (Geometric Optics): *Illuminance versus Distance* (Page 91)** **Hybrid of this and the following** ❑ **ASIM *Light Intensity* Activity (In back pocket of Geometric Optic s Binder)** ❑ **Discuss Activity #6 (Geometric Optics): *Notes on Inverse Square, Illuminance and Photometric Terms* (Page 79)**	**AAPT/PTRA (1 1/2 hour)**
2:30 – 3:45 PM	❑ **Activity #10 (Geometric Optics): *Making a Paraffin Wax Photometer and Measuring the Luminous Intensity of the Sun* (Page 105)**	**AAPT/PTRA (1 1/4 hour)**
3:45 – 4:15 PM	❑ **Activity #12 (Geometric Optics): *How To Measure An Angle With A Protractor* (Page 119)**	**AAPT/PTRA (1/2 hour)**
4:15 -5:00 PM	❑ **Start Activity #13 (Geometric Optics): *Objects, Flat Mirrors, and Properties of Images* (Start on Page 123) Do only the first 5 Pages!**	**AAPT/PTRA (3/4 hour)**
5:00 PM	**Dinner (On Your Own)**	

8 hours

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Tuesday June 13, 2017

8:00 – 8:30 AM	❑ **Whiteboard Activity #13 (Geometric Optics): *Objects, Flat Mirrors, and Properties of Images* (Page 123)**	**AAPT/PTRA (1/2 hours)**
8:30 - 10:00 AM	❑ **Activity #14 (Geometric Optics): *Reflection of Light from a Flat Mirror* (Page 139)**	**AAPT/PTRA (1 1/2 hour)**
10:00 - 11:00 AM	❑ **Use a laser to demonstrate a retro reflector instead of Activity #15.** ❑ **Activity #15 (Geometric Optics): *Reflection of Light from Multiple Flat Mirrors* (Page 155). Have Mirrors out and discuss what it shows in the laboratory activity.**	**AAPT/PTRA (1 hour)**
11:00 AM - Noon	❑ **Activity #16 & #17 (Geometric Optics): *Sample Tests on Reflection and Flat Mirrors* (Discuss Pages 165 & 169)** ❑ **Activity #21 (Geometric Optics): *Family Physics Concave Mirror* (Discuss Page 203)**	**AAPT/PTRA (1 hour)**
Noon - 1:00 PM	**Lunch (On Your Own)**	**Noon - 1:00 PM**
1:00 - 2:00 PM	❑ **Jim Minstrell**	**Facet Innovations (1 hour)**
2:00 – 4:00 PM	❑ **Do a demonstration with large mirrors. Measure d_o, d_i and f Page 187** ❑ **Activity #20 (Geometric Optics): *Properties of Images Formed by a Concave/Convex Mirrors* (Page 187)** ❑ **For now skip ray diagram questions 2, 3 & 5 on Pages 189-190.**	**AAPT/PTRA (2 hours)**
4:00 – 5:00 PM	❑ **Begin Activity #22 (Geometric Optics): *Ray Diagrams for Curved Mirrors* (Page 207) Participants use templates on Pages 211 & 214 to do their diagrams.** ❑ **Activity #23 (Geometric Optics): *Worksheet on Reflection and Mirrors* (Page 217)** ❑ **Return to Activity #20 *Properties of Images Formed by a Concave/Convex Mirrors* Do questions 2, 3 & 5, Pages 189-190 to complete ray diagrams**	**AAPT/PTRA (1 hours)**
-	❑ **Activity #18 (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, Anamorphic Art, etc.) (Pages 175-176)** ❑ **Have Confocal Mirrors out for the teachers to consider and think about. (Page 199)**	**Have demonstrations out for teachers to observe.**
5:00 PM	**Dinner (On Your Own)**	

8 hours

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Wednesday, June 14, 2017

8:00 - 9:00 AM	❑ **Finish Activity #22 Activity #22 (Geometric Optics): *Ray Diagrams for Curved Mirrors* (Page 207) Participants use templates on Pages 211 & 214 to do their diagrams.** ❑ **Activity #23 (Geometric Optics): *Worksheet on Reflection and Mirrors* (Page 217)** ❑ **Return to Activity #20 *Properties of Images Formed by a Concave/Convex Mirrors* Do questions 2, 3 & 5, Pages 189-190 to complete ray diagrams**	**AAPT/PTRA (1 hour)**
9:00 – 11:00 AM	❑ **Activity #25 (Geometric Optics): *Refraction of Light - Liquids* (Page 227)**	**AAPT/PTRA (2 hour)**
11:00 – 11:30 AM	❑ **Activity #26 (Geometric Optics): *Disappearing Solution* (Page 241)**	**AAPT/PTRA (1/2 hour)**
11:30 - Noon	❑ **Activity #27 (Geometric Optics): *Fish Tank Demonstration* (Page 242)**	**AAPT/PTRA (1/2 hour)**
Noon - 1:00 PM	**Lunch (On Your Own)**	
1:00 – 3:00 PM	❑ **Activity #28 (Geometric Optics): *Refraction of Light - Solids* (Page 243)**	**AAPT/PTRA (2 hour)**
3:00 – 5:00 PM	❑ **Activity #29 (Geometric Optics): *Index of Refraction and Prisms (Simulation)* (Page 255)**	**AAPT/PTRA (2 hours)**
5:00 PM	**Dinner (On Your Own)**	

8 hours

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Thursday, June 15, 2017

8:00 – 9:30 AM	❑ **Activity #30 (Geometric Optics): *Critical Angle* (Page 253) *(Simulation)***	**AAPT/PTRA (1 1/2 hour)**
9:30 - 11:30 AM	❑ **Activity #35 (Geometric Optics): *Properties of Images Formed by a Converging Lens II* (Page 295) The teachers look at collection of converging/diverging lenses and pick out the convex/conversing lens to use.** ❑ **If time, discuss confocal mirrors.**	**AAPT/PTRA (2 hours)**
11:30 - Noon	❑ **Activity #41 (Geometric Optics): *Demonstrations Using A Dissectible Lens* (Page 343)**	**AAPT/PTRA (1/2 hour)**
Noon - 1:00 PM	**Lunch (On Your Own)**	
1:00 - 2:00 PM	❑ **Jim Minstrell**	**Facet Innovations (1 hour)**
2:00 - 4:00 PM	❑ **Activity #39 & #40 (Geometric Optics): *Ray Diagrams and Worksheet 2 Lenses On Refraction and Lenses* (Pages 327 & 335)**	**AAPT/PTRA (2 hour)**
4:00 - 5:15 PM	❑ **Activity #36 (Geometric Optics): *Mammalian Eye* (Page 300)**	**AAPT/PTRA (1 1/4 hour)**
5:15 PM	**Dinner (On Your Own)**	

8 & 1/4 hours

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Friday, June 16, 2017

8:00 – 9:30 AM	❑ **Activity #37 (Geometric Optics): *Diverging Lens* (Page 319)**	**AAPT/PTRA (1 1/2 hour)**
9:30 - 10:30 AM	❑ **If time do Activity #45 (Geometric Optics): *Efficiency of Various Light Bulbs* (Page 359)**	**AAPT/PTRA (1 hour)**
10:30 - 11:00 AM	❑ **Let's do "Video in the Classroom"**	**Dr. Schamschula Alabama A&M (1/2 hour**
11:00 AM - Noon	❑ **Activity #46 (Geometric Optics): *Microwave and Speed of Light* (Page 369)**	**AAPT/PTRA (1 hour)**
Noon - 1:00 PM	**In house Lunch**	
1:00 – 2:00 PM	❑ **Waves and Geometric Optics, Post Content Assessment** ❑ **Post Institute Survey**	**Eric Banilower & Kieth Esch Horizon Research, Inc.**

5 hours