Lesson Plan
Victor Blanco in Chilean Skies

Grade Level(s): 9-12
Subject(s): History, Physics

In-Class Time: 70 min
Prep Time: 30 min

Materials
• Computers for the Sloan Digital Sky Survey Scavenger Hunt
• Discussion sheets
• Printed Copies, or electronic copies and a way to access them, of the resources to use for the debate
  o Victor Blanco’s Auto Biography
  o If students have access to internet already, let them use computers/smartphones to research more
  o Ethos, Pathos, Logos worksheet from wordpress.com (just first sheet)
• A projector screen to compare raw observatory photos to the commercial versions

Objective
In this lesson students will learn about the life and work of Victor Blanco. Students will experience both the struggles of working in an observatory with data, and the struggles working with people. Issues will be brought up about science and its role in society at large.

**Introduction**

Victor Blanco was born in Guayama, Puerto Rico in 1918, son of a policeman and housewife, youngest of 9 siblings [1]. Blanco worked both tending cows and in a furniture store to help provide for his family, and had a long-standing love for making furniture ever since. Blanco knew from a young age he wanted to study astronomy. Starting in high school, Blanco was lucky to have encouraging science and mathematics teachers and began reading Popular Science magazines. Within a couple tears Blanco learned enough to build his own telescope. Due to lack of opportunities in Puerto Rico, Blanco decided to go to the United States, attending the University of Chicago. When Blanco went to Chicago, in 1939, with the money he had saved from furniture making, he only had enough money for a single semester. After the semester ended, and Blanco passed with straight A’s, Blanco went to go talk to the dean of his school. Blanco presented his skills and his situation, and left the meeting with free tuition and a part time job at the local drugstore [1]. Blanco decided to take a break from his studies to go research at the McDonald Observatory in Texas, then run by the University of Chicago, in 1940. However, this position did not go as intended as it was interrupted by a draft summons. Blanco spent the next 6 years in the military working on photographing, repairs of aircraft equipment, and tropical meteorology. After returning to school. Blanco received his bachelor’s using the credits granted to him by the military and continued his graduate studies at UC Berkeley. After getting his Ph.D., Blanco decided to go back to Puerto Rico, but after a year of teaching the University of Puerto Rico could no longer afford to pay him. He then instead went to work at the Case Institute of Technology in Ohio. Here Blanco did research survey the Milky way for Red Stars and M-type stars. Blanco at one point took a leave of absence and went to Java, Indonesia to help in the completion of a telescope at the Kitt Peak National Observatory. After this work, Blanco became the director of the Cerro-Tololo InterAmerican Observatory in Chile. The observatory was a collaborative, politically neutral science centered zone in which, main American and Chilean, but all astronomers of all nationalities could come research. Blanco helped with the construction of equipment, procurement of telescopes, and developments of the international program. This at time caused some tensions, as Blanco states in his auto biography

“Not long after General Pinochet became president, I accompanied a delegation from KPNO and AURA that met him. As I had done previously when seeing Allende, I prepared a pamphlet explaining our operations and verbally summarized its contents. Unlike Salvador Allende, who promised his support, General Pinochet limited himself to acknowledging the information we provided. No untoward incidents affecting CTIO occurred, but at one time we were told that General Pinochet wanted to visit Cerro Tololo, and I was asked by one of his adjutants to provide a list of our staff members indicating the political affiliations of each person. I replied that we had always adhered strictly to a policy of staying out of Chile’s politics and could not continue to do so were we to inquire about Chilean staff political affiliations. General Pinochet visited Cerro Tololo anyway, and we kept those Chilean staff members we knew to have been pro-Allende well away. [1]"

After CTIO was finished, Blanco could get back to his research working there, and worked on determining the structure of our galaxy. Blanco retired in 1981. Since then the 4-m telescope at CTIO was renamed the Blanco 4m, and a fellowship under his name was developed by the National Society of Hispanic Physicists [2]. Blanco died in 2011, at age 92[3].
Engage: 5 Minutes

Explain briefly what Victor Blanco did and what he researched

What is the teacher doing?
The teacher will briefly explain the life of Victor Blanco, making sure not to mention the political stress in Chile at the time of his leadership at the CTIO. This should be extremely brief, as there is a lot of other things to get done in the lesson plan. Out more of a focus on the stellar identification research Blanco did, and his contributions to astronomy and introduce the next activity. Make sure you answer the questions provided in the discussion sheet!

What are the students doing?
Learning a bit about Victor Blanco and his life, while answering the first few discussion questions.

Explore: 15 Minutes

Sloan Digital Sky Survey Star Scavenger Hunt

What is the teacher doing?
The teacher will be introducing the star scavenger hunt activity and explaining that while this is not the same survey that Blanco worked on, this is the same kind of work he did. Blanco helped determined the makeup of the galaxy and star formations using the information gained form direct observational telescopes. Tell the students they will be working on finding different types of astronomical objects while looking at a limited view of the sky.

What are the students doing?
The students will be using the Sloan Digital Sky Survey scavenger hunt tool to fins different object in the picture provided. They will have to read through the brief introduction on the website to understand how to navigate the online portal. The guide will also explain how to find the different object and give a key. They will then take time to find as many objects as possible and log them in the sheet provided on the site. The students will begin to realize the work that goes into observational work, and the breadth of the universe by seeing all the different things in a small area of the sky. Asking questions when needed.

Explain: 10 Minutes

Have students explain what might be difficult, go through observing process and explain getting the pictures is even hard, morph into the politics of the time. Explain the intricacies in running a multinational science center in the face of a new government.

Instructions

**What is the teacher doing?**
Leading a short discussion about what was difficult to find in the scavenger hunt, and what was easier to find. Show the students some non-edited pictures from observational telescopes so they can see how much effort goes into just making the pictures they see as colorful and bright as they are. Suggested pictures to compare are in the Required Resources.

**What are the students doing?**
Explaining their difficulties, what was easier than they expected, and what things they learned, asking questions as necessary.

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**Elaborate: 40 Minutes**
Naturally will come from explain section, explain the political climate of Chile at the time, and the role of governments in scientific enterprise. Leave time for students to give options about science’s relation to politics in discussion question, or run a debate.

**What is the teacher doing?**
Explain that Victor Blanco was doing this difficult research while building and observatory, nearly from scratch, for international scientists, in a highly politicized situation. Recount the experience Victor Blanco describes in his autobiography, of having the leader of the newly formed government come to assess the need for the observatory, and having to hide some of the observatories employees.

Tell the students they will be breaking up into 4 groups, 2 for the observatory, 2 for the cabinet of the ruling newly formed government with fears of insurrection. Each side will have 10 minutes to research, and will then fight for their position on the need for an internationally based observatory.

Give the students some resources to use after breaking them into groups. Once 10 minutes has passed, have one set of steams come up at a time and debate to the leader of the country (you) the need (or lack thereof) for an international observatory.

At the end of the debates be sure to highlight the actual result of this interaction from Victor Blanco’s Auto Biography (recounted on page 13)

**What are the students doing?**
The students will be researching for their group assigned to debate the necessity for an international observatory in the face of needed international security in a new government. The groups will have to debate so practicing argument styles and modes of persuasion will be very important.

After being called up for the debate each group will be asked to convince the leader of the country (the teacher) whether a new unstable country should house an international scientific observatory.
Evaluate:
Evaluate the completion and accuracy of the Scavenger Hunt pages, along with participation in debate, along with the discussion questions.

Required/Recommended Reading and Resources

- Pictures to compare for after scavenger hunt activity: https://busyteacher.org/7245-conducting-class-debate-essential-tips.html
- These are a range of resources debating the issue of science’s involvement in politics, as well as international science. These sources were organized to show a wide range of viewpoints, and does not reflect AIP’s views. Feel free to choose different sources to use
  - Williams Pierce, *the role of Science and Politics in public policy decision making*, The Huffington Post, August 3, 2012
  - Beth Marie Mole, *Q&A: Mixing Science and Politics*, The Scientist, October 9, 2012
  - Ben Shapiro, *8 reasons to close the Border now*, Breitbart.com, July 8, 2014
  - Roque Planas, *16 Reasons why Opening our borders makes more sense than Militarizing them*, The Huffington Post, September 2, 2014

Discussion Questions
Discussion Questions can be found as a Handout with a corresponding Answer Key in the Supplemental Materials to this lesson plan.

1. Where and when was Victor Blanco Born?
   a. He was Born in Puerto Rico in 1918
2. Why did Victor leave Puerto Rico?
   a. To study astronomy in the United States
3. When did Blanco go to work at the Cerro Tololo InterAmerican Observatory in Chile?
   a. 1967
4. What was Blanco’s Position at the observatory and what was his main work there?
   a. Director, building the observatory and collecting equipment.
5. When Blanco got back to research what did he do?
   a. Studied the structure of the galaxy and star formation
6. FIND THE OBJECTS IN THE SCAVANGER HUNT
   a. Link to scavenger hunt sheet provided in the required readings.
7. Why did the Salvador Allende’s rise to power cause concern for some of the scientists working at the observatory?
   a. The observatory was a collaboration with the United States, and Allende was anti-US

8. What was the outcome of the visit from the new leader after the overthrow of Allende, General Pinochet?
   a. They decided to keep the observatory open

9. Take Notes here for the debate

Further Reading and Additional Resources

- Official CTIO Website: [http://www.ctio.noao.edu/noao/](http://www.ctio.noao.edu/noao/)

Extensions

For science policy interests:

Goeffrey Hunt, *what is Science Policy?* ASBMB today, 2010

Common Core Standards


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<tr>
<th>Reading: Literature</th>
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<tr>
<td>CCSS.ELA-LITERACY.RL.11-12.1</td>
<td>Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matter uncertain</td>
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<tr>
<td>CCSS.ELA-LITERACY.RL.11-12.3</td>
<td>Analyze the impact of the author’s choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters are introduced and developed)</td>
</tr>
<tr>
<td>CCSS.ELA-LITERACY.RL.11-12.7</td>
<td>Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.)</td>
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<th>Reading: Informational Text</th>
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<td>CCSS.ELA-LITERACY.RI.11-12.1</td>
<td>Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matter uncertain</td>
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<tr>
<td>CCSS.ELA-LITERACY.RI.11-12.3</td>
<td>Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text</td>
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<tr>
<td>CCSS.ELA-LITERACY.RI.11-12.6</td>
<td>Determine an author’s point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text.</td>
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<td>CCSS.ELA-LITERACY.Ri.11-12.7</td>
<td>Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words to address a question or solve a problem.</td>
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<tr>
<td>Writing</td>
<td>Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience’s knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from and supports the argument presented.</td>
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<td>CCSS.ELA-LITERACY.W.11-12.7</td>
<td>Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</td>
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<tr>
<td>Speaking &amp; Listening</td>
<td>Initiate and participate effectively in a range of collaborative discussions (onion-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue;</td>
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<td>Standard</td>
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<td>CCSS.ELA-LITERACY.SL.11-12.3</td>
<td>Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used</td>
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<td>CCSS.ELA-LITERACY.SL.11-12.3</td>
<td>Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</td>
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<td>Language</td>
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<td>CCSS.ELA-LITERACY.L.11-12.3</td>
<td>Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. a. Vary syntax for effect, consulting references (e.g., Tufte’s Artful Sentences) for guidance as needed; apply an understanding of syntax to the study of complex texts when reading.</td>
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<td>CCSS.ELA-LITERACY.L.11-12.5</td>
<td>Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., hyperbole, paradox) in context and analyze their role in the text. b. Analyze nuances in the meaning of words with similar denotations.</td>
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<td>History/Social Studies</td>
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<td>CCSS.ELA-LITERACY.RH.11-12.1</td>
<td>Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text.</td>
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<td>CCSS.ELA-LITERACY.RH.11-12.3</td>
<td>Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matter uncertain.</td>
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<tr>
<td>CCSS.ELA-LITERACY.RH.11-12.6</td>
<td>Evaluate authors’ differing points of view on the same historical event or issue by assessing the authors’ claims, reasoning, and evidence.</td>
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<tr>
<td>CCSS.ELA-LITERACY.RH.11-12.9</td>
<td>Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.</td>
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<td>Science &amp; Technical Subjects</td>
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<tr>
<td>CCSS.ELA-LITERACY.RST.11-12.7</td>
<td>Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) to address a question or solve a problem.</td>
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### Subject Writing

| CCSS.ELA-LITERACY.WHST.11-12.8 | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |

### Next Generation Science Standards


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<td>Dimension Three: Disciplinary Core Ideas</td>
<td>Core Idea</td>
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