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February 5, 2021

## 1 How to Submit this Midterm

1. Complete your work on this midterm.
2. Scan it into PDF form using a smartphone app, scanner, or digital picture
3. Alternatively you can type up your answers in a separate file, but it still must be a PDF
4. Submit it using the link on Moodle

## 2 Maps of The New World

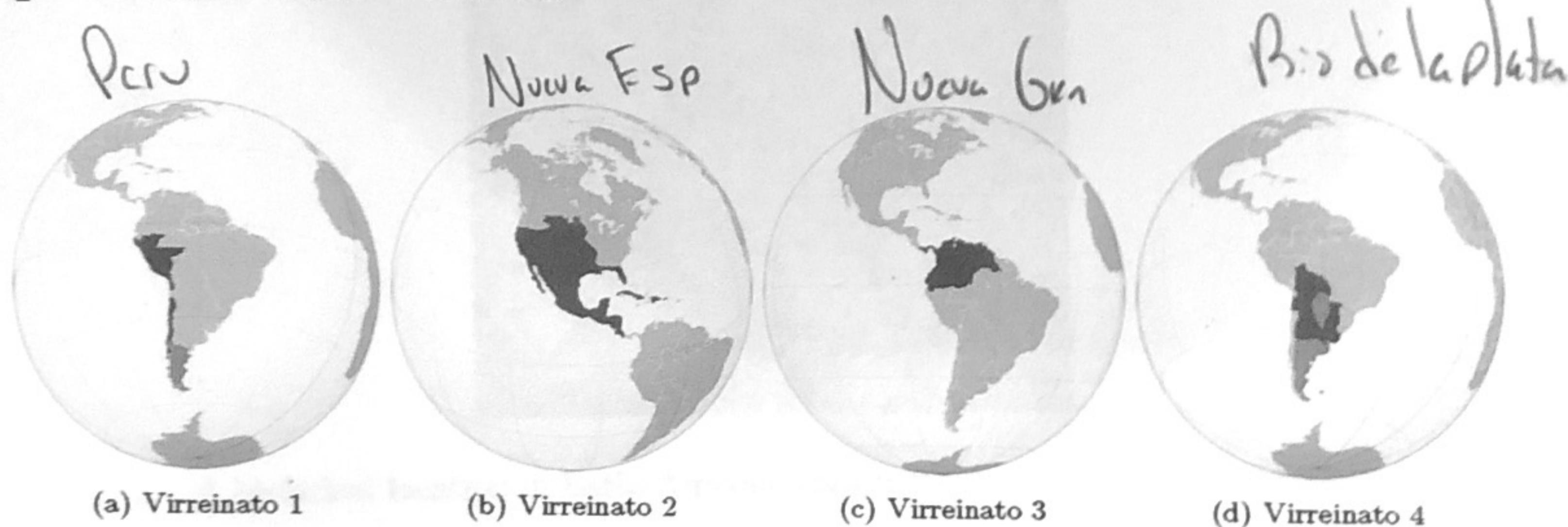


Figure 1: There were up to four *virreinatos* during the Spanish colonial period of Latin American history.

1. In which of the four *virreinatos* of the Spanish colonial empire (shown in Fig. 1) was the *tlé huitzilin* classified by the indigenous? In Virreinato 2 (b)
2. Which of the four *virreinatos* excelled at the exportation of rum? Virreinato 3 (c)
3. Which of the four *virreinatos* was characterized by an indigenous empire that mastered agriculture in the Andean mountains? Virreinato 1 (a)
4. The low-latitude aurora of 1789 was observed in *which cities?* In which of the four virreinatos are these cities? List some other countries in which corresponding observations were made. In Charcas,
5. List some of the locations explored by La Condamine and his Latin American colleagues, and cite the virreinato or virreinatos they explored together. They explored parts of the Amazon chart's the course of some and parts of Quito in Virreinato 1 (a) and Virreinato 3 (c)
6. The Expedición Botánica of José Celestino Mutis took place in which virreinato? Virreinato 3, Nueva Granada
7. José Celestino Mutis took place in which virreinato? Mutis was the inaugural chair of the department of mathematics at the Colegio del Rosario. In which city is this? In Nuev Granada or Virreinato 3 (c) in Santa Fe de Bogota.
8. In which country is the Pierre Auger Observatory located? In which virreinato would this country have been in the 18th century? It is located in Present day Argentina, the Virreinato would be 4 (d)

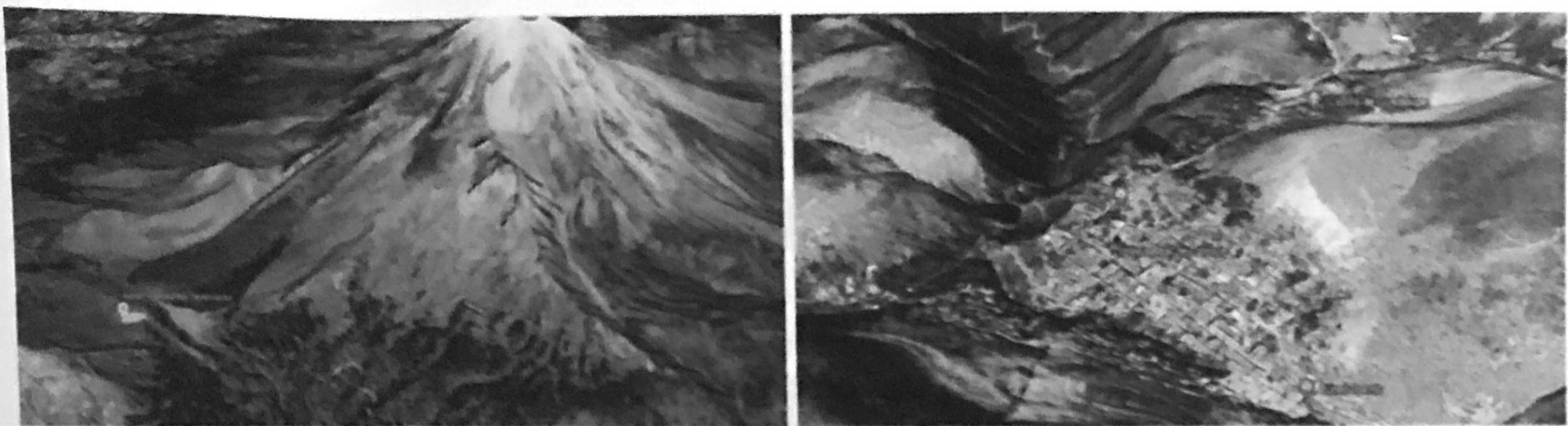


Figure 2: (Left) A physics detector near Pico de Orizaba in Mexico. (Right) A town in central Mexico.

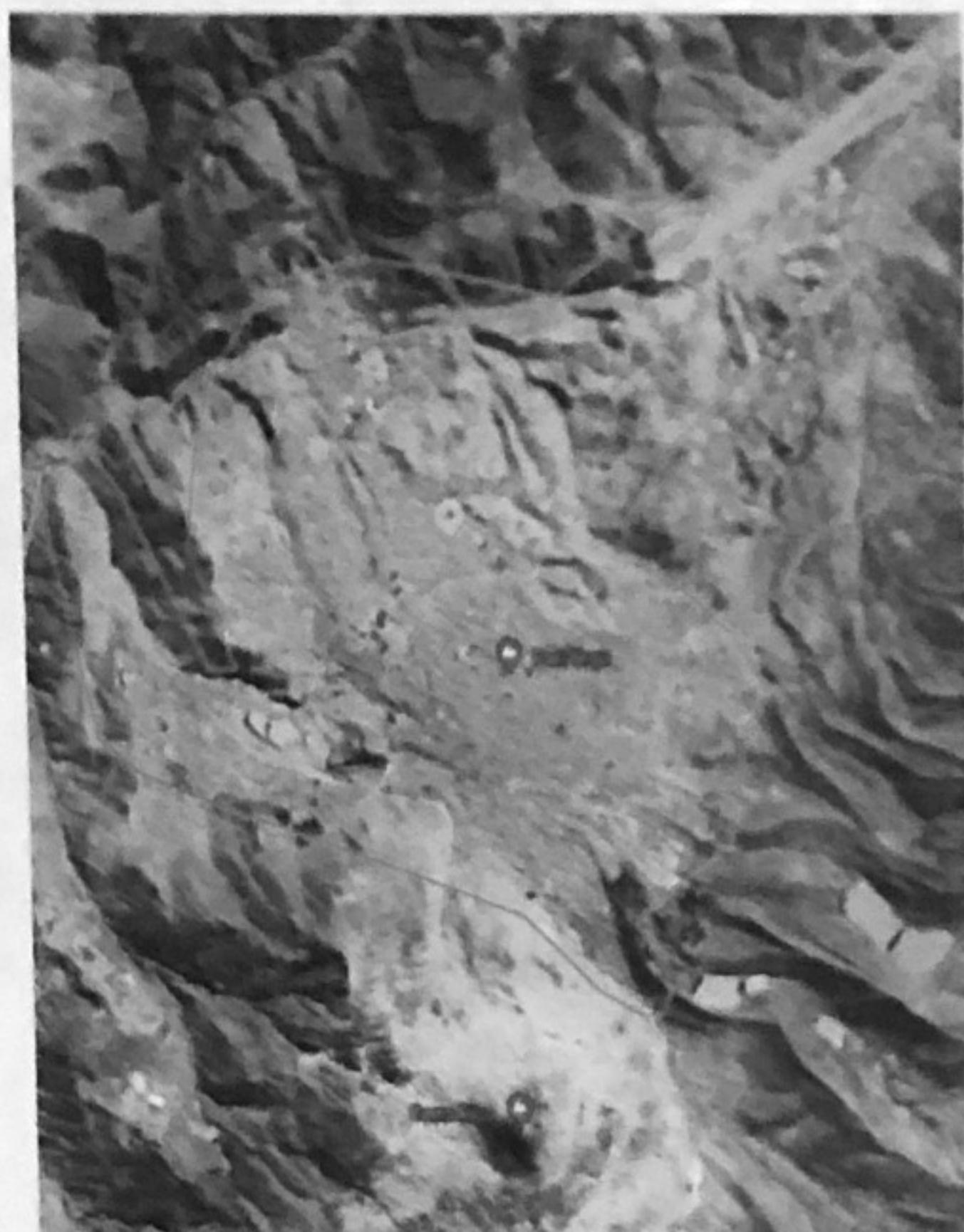


Figure 3: A historical location in Latin America known for driving a particular economic sector.

### 3 Asynchronous Activity Review I

- What is the physics detector shown in Fig. 2 (left)? Explain in basic terms the purpose of this detector and how it works.   
The Physics detector shown in figure 2 (left) is the HAWC Gamma-ray Observatory (High Altitude Water Cherenkov Observatory) that gathers cosmic rays and gamma rays as they scatter through the mountains and are absorbed by water tank detectors.
- What is the significance of Mexican cities as pictured in Fig. 2 (right), in the context of the development of colleges and the scientific community in 18th century Mexico?   
The significance of the cities and locations with regard to education and science showed just how essential mining was at the time. Colleges focused on mining efficiency and since the mountains within the range contained silver, they now have the manpower and economy to do so and expand.
- Trade routes also made these cities efficient.
- What city is being shown in Fig. 3? In which country is it located, and what was the historical significance of this city for international trade? Who controlled it? From where the commodity produced here originated, and how was it shipped to Europe and Africa?   
This city is San Luis Potosí located in Central Mexico and X. Its actual significance was its mining and its society centralized around gold and (Education) Technology. It was significant because of how much gold it produced into trade. It was controlled by the indigenous Spaniards that colonized it. The commodity of silver, gold, and silver came from the mines around the Real de Catorce and Shiprock, New Mexico, and was shipped to Europe and Africa.

0	1	2	3	4
5	6	7	8	9
10	11	12	13	14
15	16	17	18	19

Figure 4: A list of the numerical digits used by the Maya.

1. Work out the following addition problems *using the Mayan system.*

Base 20 System

(a)  $80 + 20 =$

(b)  $365 + 365 =$

(c)  $1024 + 512 =$

2. Work out the following subtraction problems *using the Mayan system.*

(a)  $1024 - 512 =$

(b)  $92 - 31 =$

3. Work out the following addition problems *using the Incan quipu:*

(a)  $512 + 256 =$

(b)  $11 + 89 =$

$\times 10^0$

$\times 10^1$

$\times 10^2$

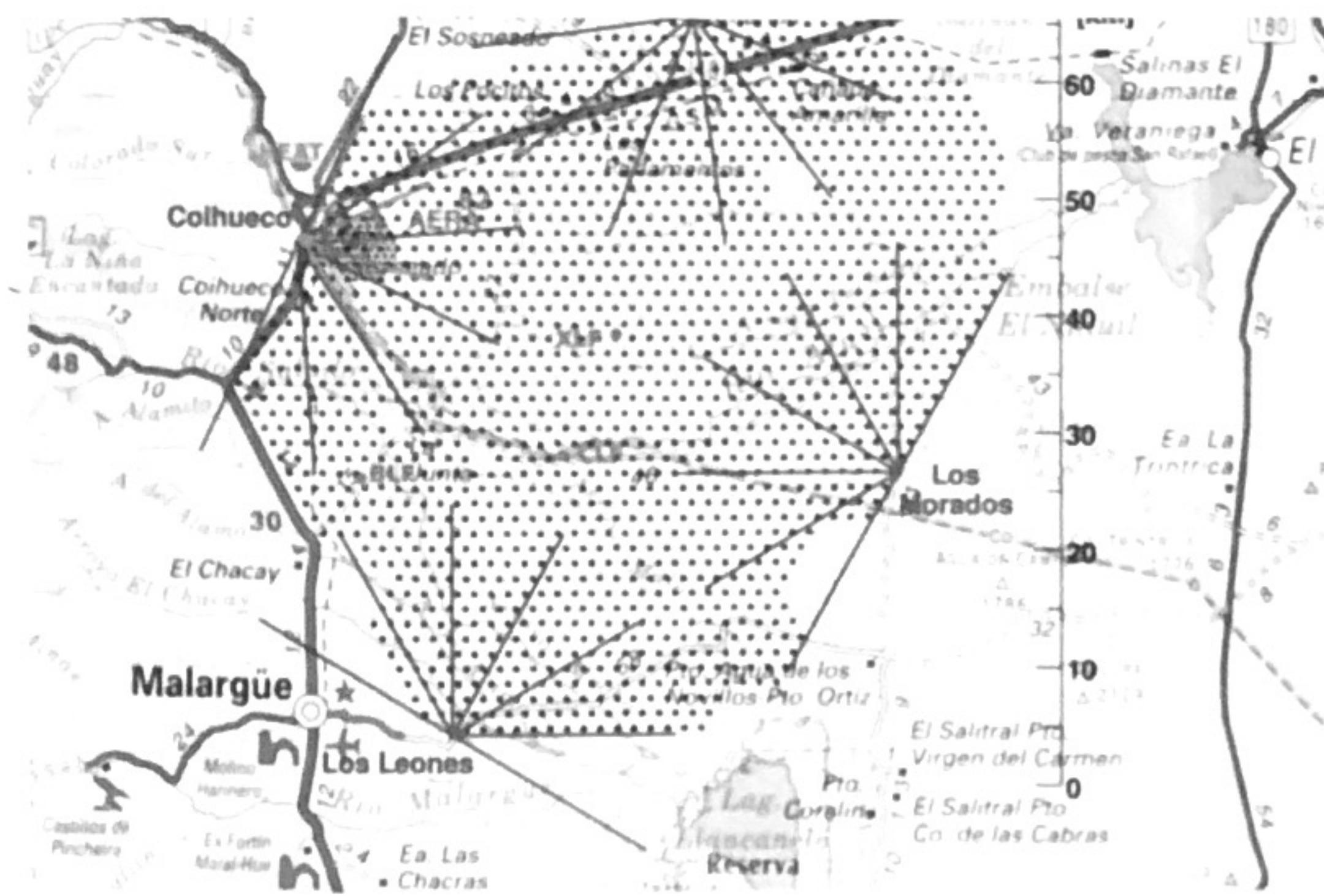


Figure 5: A physics detector near Malargüe, Argentina.

4. Work out the following subtraction problems *using the Incan quipu*:

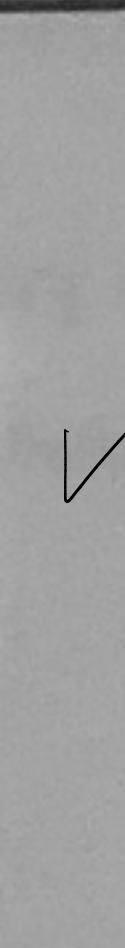
(a)  $365 - 67 =$

*298*



(b)  $1024 - 512 =$

*512*



5. Suppose you have six terrace plots in the Andean mountains to use to survive. You and your cohort of fellow Incans decide to grow potatoes and quinoa. Quinoa actually do better at higher altitudes than potatoes. So the plan is to use the two lowest terraces for potatoes, and the upper four for quinoa. Each terrace is 30 meters by 5 meters. A potato plant requires a 0.2 meter by 0.2 meter patch, and a quinoa plant requires a 0.3 meter by 0.3 meter patch. How many potato plants and how many quinoa plants can you plant? Store the results in a diagram of quipu knot system.

*600*

Quinoa:

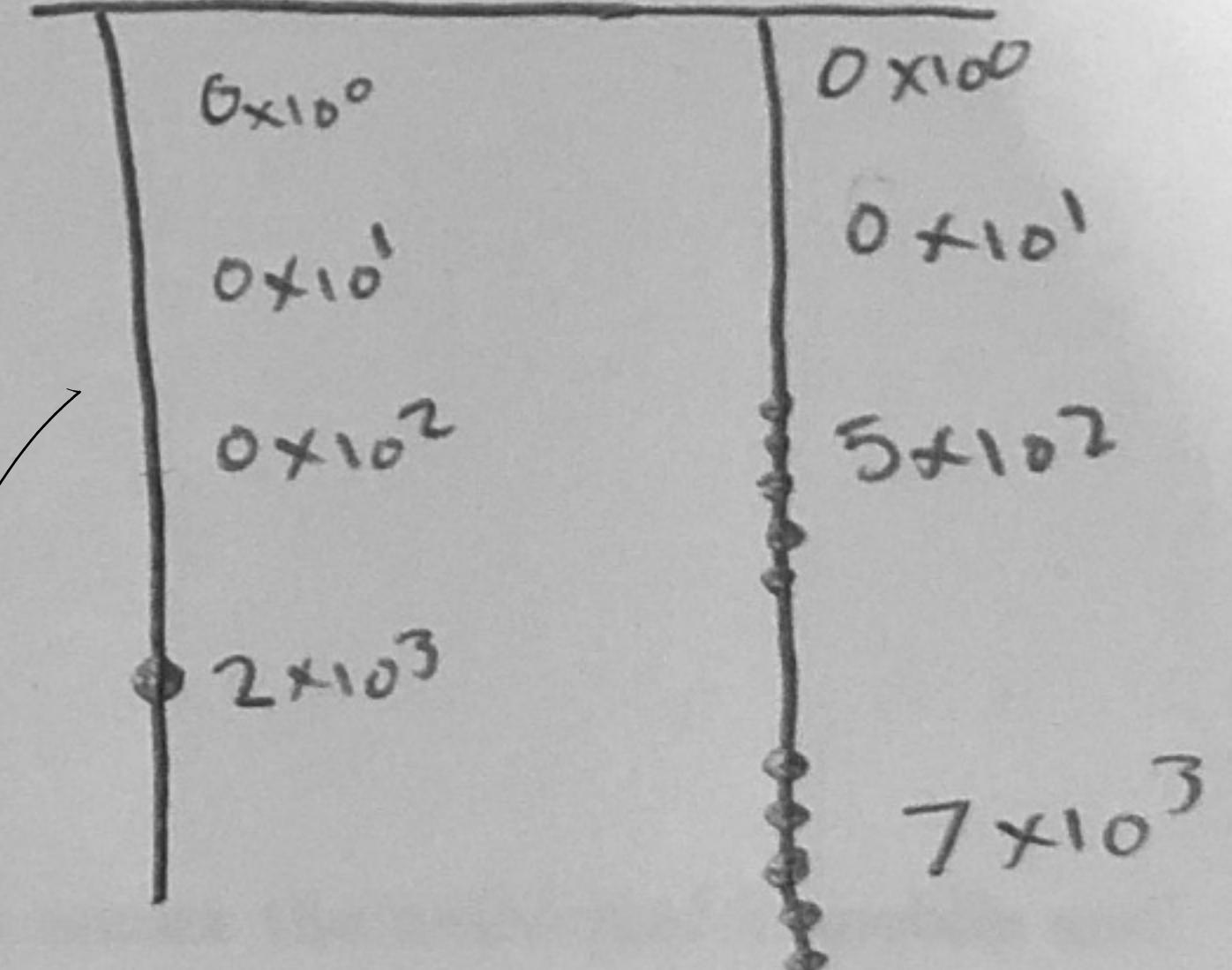
$$4 \times (30 \times 5) \text{ m}^2$$

$$\frac{(3/10)(3/10) \text{ m}^2}{(0.3)(0.3) \text{ m}^2}$$

$$= 6666.6 = 6667$$

$\times 4 = \frac{6667}{\times 3/10} = 2000 \times$

$\times 2 = \frac{300}{\times 5} = 7500 \checkmark$



## 5 Connection to Physics

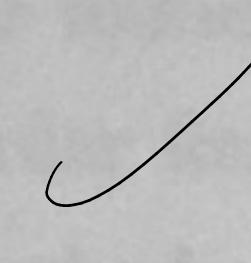
1. In Fig. 5, what physics detector is shown?

- A: The Large Hadron Collider
- B: The IceCube Neutrino detector
- C: The Pierre Auger Observatory
- D: The High Altitude Water Cherenkov detector



2. What is the purpose of the physics project shown in Fig. 5?

- A: To collide protons and nuclei to probe sub-atomic physics
- B: To detect signals from neutrinos that originate outside the solar system
- C: To detect cosmic rays that originate outside the solar system



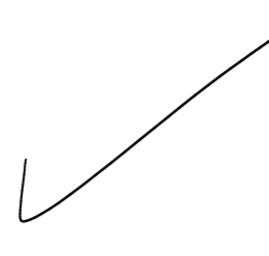
What is a gamma ray

- A: A photon of light
- B: A proton or nucleus from deep space
- C: A portion of the aurora borealis
- D: An ion floating in the atmosphere

X photon (a) (1)

4. What is located at each black dot in Fig. 5?

- A: A water tank designed to record Cherenkov radiation
- B: A radio receiver designed to record radio pulses
- C: An optical sensor designed to record visible light
- D: A telescope designed to detect infrared radiation



## 6 Vocabulary

1. What is the meaning of the term *rationalism*?

- A: The idea that reason rather than experience is the foundation of certainty in knowledge
- B: Encapsulating the idea of *I think, therefore I am*.
- C: Using scientific instruments
- D: Relying on measurements and sensory experience to discover the truth

(1) A

2. What is the meaning of the *Nahuatl* term *abuizotl*?

- A: A horse
- B: A hummingbird
- C: An otter
- D: An alligator



3. What is the meaning of the *Nahuatl* term *tomatl*?

- A: Smoked fish
- B: Smoked chili
- C: An herb to help digestion
- D: A tomato



4. What is *cinchona*?

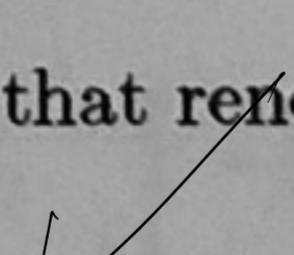
- A: An herb used to treat indigestion
- B: A shrub or tree used to create quinine
- C: A flower used in religious rituals of the *Mexica* people
- D: A plant that can form a treatment for syphilis

(1)

(B)

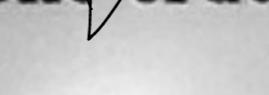
5. Define the word *torpor*, as it pertains to animal behavior.

- A: The ability to hover in midair during flight using rapid wingbeats
- B: Lowering internal body temperature and metabolism to levels that render the individual immobile and in a hibernating state
- C: The ability to break open the shells of mollusks using tools
- D: The ability to distinguish complex sounds in songs or calls



6. Who were the *Jesuits*?

- A: Formally known as the Order of Preachers, this is a Catholic order founded by Saint Dominic
- B: Formally known as the Order of Friars Minor, this is a Catholic order founded by Saint Francis
- C: Formally known as *Los Amigos del País*, these were mining officials who formed guilds to further economic interests of their region
- D: Formally known as the Society of Jesus, this is a Catholic order founded by Saint Ignatius of Loyola



1. Kepler's Laws, and Newtonian Physics Discuss the varying levels of acceptance within scientific and academic communities in Nueva Granada and Perú in the late 18th century.

At this point late into the 18th Century, The transition of Scholastic thought to Newtonian and Copernican ideology began with instructors like Mutis and Creole Unanue. Divided by strict orthodoxy more in Peru however, caused them to be more careful upon this transition due to the power of the church and Dominicans.

2. The aurora of 1789 Discuss the significance of the aurora borealis in 1789 that was visible from Mexico City. List several researchers who made observations of this aurora and other auroras, and explain what they found.

The Significance of Aurora Borealis in 1789 Demonstrated Copernican and Newtonian thought and ideas upon the generation that viewed so to establish a reason for the lights. Suches Sir Edmund Halley with regard to magnetized poles action proposed. It also proposed meaningful discussion and appliances to Enlightenment advocates of reason and rationalism. Between significant people like Leon y Gama, Alarcón y Barreiro, Maizan, etc.

3. Herbal medicine in the 16th century Give several examples of treatments for various ailments in the body used by Europeans and indigenous Latin Americans in the 16th century. Explain the theory of the four humors and why this influenced the European treatments but not the indigenous ones.

Europeans would cure Dysentery with a concoction of Marure, wine, pig feet, dog urine, etc while the Latin Americans would treat Diarrhea with Native fare suches Tzapotl, tortilla salt & chili fruit etc. The theory was that if you were healthy individual, your 4 humors, (black and yellow bile, blood, phlegm) would beat peace and if you weren't your humors would be imbalanced. Lacking of one through extremes aligned with a product of the earth.

4. The Inquisition, the Catholic Church, and Scientific Traditions Discuss several examples of the following:

(a) Catholic censorship of knowledge flowing from Europe to Latin America (b) Catholic censorship of knowledge flowing from Latin America to Europe (c) contributions to Latin American science by Catholic scholars and explorers (d) knowledge that was recorded or translated from indigenous sources by Catholic priests, monks, or nuns.

- a) One example could be the inquisition prohibiting the work of Voltaire and Rousseau, the Maintenance of Scholasticism over Rationalism, the regulation of the importation of books.
- b) A few examples could be the oppression or the force thus placed for Scientists such as Jose I. Bartolaches's work in Literature, art, Sciences etc... that added knowledge and application onto enlightenment principles, Maps and geographical locations, Botany.
- c) The geography and ~~go~~ course of parts of quito by Father Magnin, The use of an introduction by Father Jean Magnin. More geographic information through "Historical Summaries of the Province and Port of Guayaquil" by Jesuit Jacinto Butron.
- d) One example could be language of the indigenas Such as Habuati, incense, by Father Bernardo de San Agun. Correct!