United Nations Educational, Scientific and Cultural Organization

International Day of Light

Summary of Herschel experiment organized by NASE

Rosa M. Ros and Beatriz García, president and vice-president of NASE

As part of the celebrations for the International Day of Light (May 16th), NASE proposed to all its countries to repeat the Herschel experiment globally. Of course, the period of time to do it was more than one day, was all the month of May 2018, in order to avoid weather problems (several days were raining or the sky was cloudy).

NASE prepared an introductory material to detect the infrared in Spanish, English and Portuguese, and received the results of the experiment in six different languages (Spanish, English, French, Indonesian, Portuguese and Romanian) from countries in four continents: Africa, America, Asia and Europe. In total 56 reports were received.

We summarize in table 1 the most extreme data from different altitudes, latitudes and longitudes (see figure 1).

Fig. 1: Places were the experiments, selected in table 1, were performed. The stars indicates all the sites mentiones in Table 1, from Northern and Southern Hemisphere, with altitudes from the sea level to about 2300 m.a.s.l.

Table 1: Summary of the temperatures, after 5 minutes, from eight experiments with thermometer in the blue, in the yellow, beyond red and in the shadow. Results by Olga Peczi, Othmani Hanen, Edgar Cifuentes, Eduardo Chung, Josephine Windajanti, Ana M. Pereira, Beatriz García

Day & time May 2018	Place	altitude	latitude	longitude	Thermometer Blue after 5'	Thermometer Yellow after 5'	Thermometer Beyond Red after 5'	Thermometer Shadow after 5'
28th 11:00	Câmpia Turzii (Romania)	285 m	46º,5	23º,5	39º	50º	54º	31º
26th 11:45	Sfax (Tunisia)	8 m	34º,5	11º	41º	46º	50º	32º
26th 11:20	Guatemala city (Guatemala)	1500 m	14º	-90º,5	32º	32º	33º	28º
15th 9:33	Panama city (Panamá)	2 m	9º	-79º,5	38º	35º	40º	36º
29th 8:05	Quito (Ecuador)	2922 m	0º	-78º,5	19º	19º,5	20º	19º
22th 11:49	Malang (Indonesia)	506 m	-8º	112º,5	54º	59º	59º	42º
17th 14:55	Foz de Iguaçu (Brasil)	164 m	-25º,5	54º,5	32º	37º	32º	25º
28th 12:30	Mendoza (Argentina)	750 m	-33º	-69º	30º	39º	36º	24º

It is easier to observe that the thermometers on the box, on the Sun spectra, presents different temperatures, but the installed beyond the red presents a higher temperature than the thermometer in the shadow, in all the cases. The infrared temperature is detected in every place and it is not depending of latitude, longitude or altitude.

To perform the experiment, it was necessary a sunny day and four thermometers (figure 2), but in some countries it was difficult to find them. In these cases, teachers found simple solutions, such as to take temperatures with only one thermometer sequentially (figures 3 and 4).

Fig. 2: Experiment at the Instituto de Formación Docente de Florida, Uruguay, conducted by professor Hebert Ferrari,

The experiment was carried out by primary, secondary and tertiary students (figures 3, 4, 5 and 6), involving boys and girls (figure 7 and 8). In some cases, the teacher or professor prepared materials very well with his/her students (figure 9).

Fig. 3: Surabaya Astronomy Club, Indonesia, teacher: Hammam Nasiruddin
Fig. 4: Colegio Salesiano Santo Domingo Savio, Úbeda, España, professor: José M. Díaz

Fig. 5: Semillero de Investigación en Astronomía “Quirón”, Colegio Quiroga Alianza, Bogotá, Colombia, teacher: Jorge Eduardo González Vargas,
Fig. 6: Școala sau Centrul Liceul Teoretic "Pavel Dan", Câmpia Turzii, Romania, teacher: Olga Peczi.

Fig. 7: Yosowilangun, Lumajang, East Java, Indonesia, teacher: Almira Sifak Fauziah Narariya
Fig. 8: Computer Science High School Cluj Napoca, Romania, teacher: Corina Toma,

The comments from different teachers were part of the proposal, and we received nice contributions, some examples:

- *The students were very happy to see that near red, in the shadow, is also warm.*
- *We could see that the difference between blue and red (infrared) was about 2 degrees. One of my students asked me: If in infrared is warm why the red stars are not so hot like blue stars?*
- *I'm so sorry that I only have 1 thermometer so I use interchangeably with the pause between every step of usage that I think will not affect each result on every step of the experiment, and the experiment is still going perfect.*
- *This experiment is very exciting and interesting to continue. I will try again someday with people of my community or school with a better experiment and it could be a part of our Astronomy educational program later.*
- *The realization of the experiment is not difficult, it is enough to have the Sun, a prism, thermometers and a little of cold blood. Even with middle school students (ages 12 to 15), the Herschel experience is fun and very important. However, with high school students, it is much more conclusive, so we can explain the existence of other forms of light that we cannot see with our eyes and that the visible spectrum is only a tiny part of the light. Having offered me such an experience is a chance for my students and me. Thank you very much for the trust you have given me.*

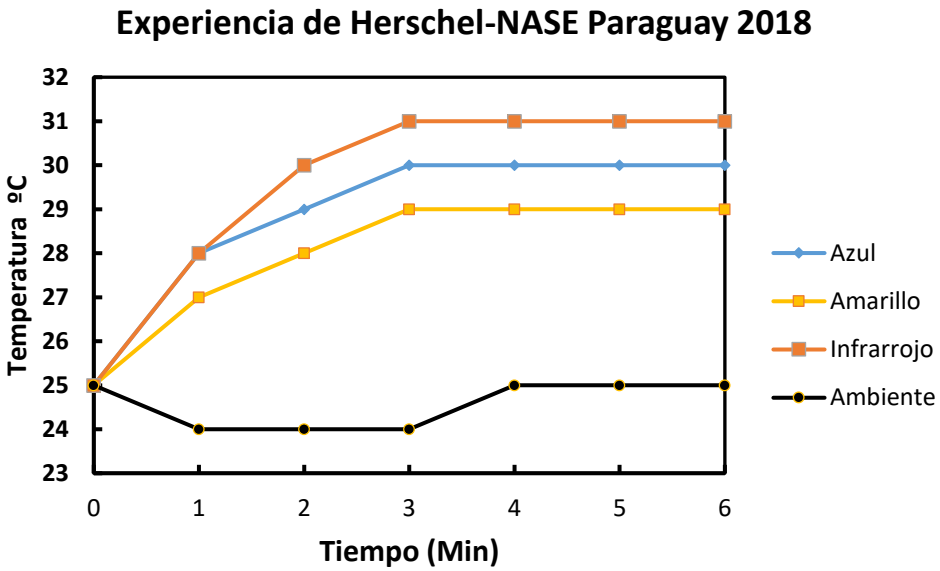

Fig. 9: Facultad de Politécnica FP-UNA y Facultad de Ciencias Exactas y Naturales FACEN-UNA, Universidad Nacional de Asunción-UNA, Paraguay, profesor: José M. Gómez.

Conclusion:

In summary, the experience had been very positive and NASE probably will repeat a similar experience in the future