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Autor(en): **Knowles Middleton, W.E.**

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The Sun glasses used by H. B. de Saussure

By W. E. Knowles Middleton

In the summer of 1981 I had the pleasure of touring the Musée d'Histoire des Sciences in the Villa Bartholoni at Geneva, under the expert guidance of Mme. M. Archinard of the Museum. This collection is particularly notable for the many items associated with one of the most celebrated citizens of Geneva, Horace Benedict de Saussure (1740–1799)[1], whose most widely known achievement was the ascent of Mont Blanc in 1787, a feat that marked the very beginning of scientific mountaineering and of mountain meteorology.

One of the exhibits in the De Saussure collection is a pair of greenish sun glasses. It occurred to me to wonder whether these would have given adequate protection to their distinguished wearer, not only against the brightness of the mountain scenery, but also against the invisible ultraviolet and infrared radiation that form an important part of the solar spectrum and can inflict damage on the retina of the eye. In 1787, while the existence of these invisible parts of the solar spectrum had recently been demonstrated [2], no one suspected their effect on the eye, and of course nothing was known about the spectral transmittance of coloured media. The suitability of glasses for protection against sunlight could be judged only by noting whether they were dark enough.

I suggested to Mme. Archinard that it would be of interest to measure the spectral transmittance of these lenses, and she arranged with the Battelle Research Centre at Geneva for this to be done. Messrs D. Gross and D. Joyeux of the Centre measured this quantity between 270 and 2400 nanometres. The two lenses turned out to be practically identical. In the visible the maximum transmittance occurs at 522 nm, at which wavelength one lens passed 42.3 per cent of the radiation and the other 42.7. The shape of the curve, shown in figure 1, is typical of green glass containing ferrous oxide.

De Saussure was very well protected against ultraviolet radiation, for the transmittance is essentially zero at wavelengths shorter than about 370 nm. On the other hand there is a high transmission of infrared radiation at wavelengths beyond 1000 nanometres. This is of course highly undesirable, although two factors combine to reduce the effect of this transmission:

firstly, the sun's radiation is relatively weak in this region, and secondly, the reflectance of snow falls to low values beyond 1400 nm[3].

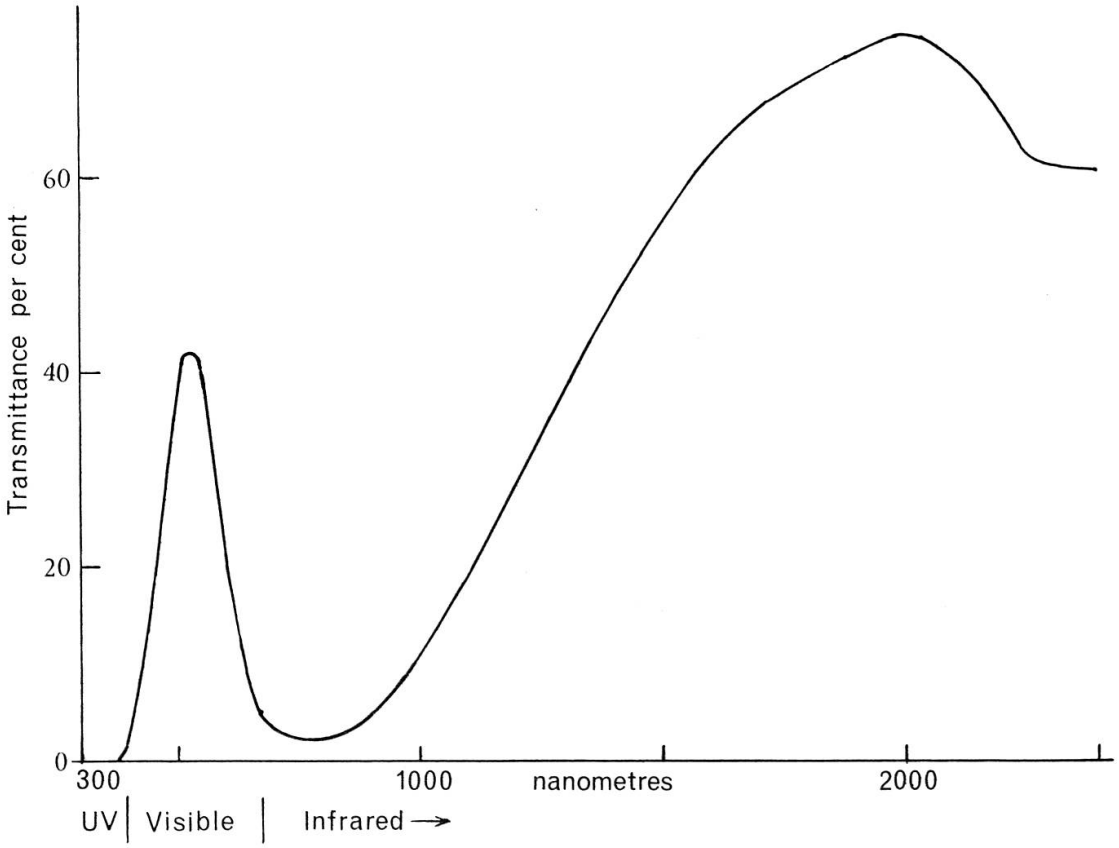

Fig. 1

Using the method of selected ordinates[4], I have calculated the overall luminous transmittance for average daylight represented by Source «C» as defined by the Commission Internationale de l'Eclairage. It turns out to be 32.1 per cent, rather more than twice the transmittance recommended nowadays for the sun glasses in official use, but nevertheless low enough to provide a good deal of comfort.

We may conclude that De Saussure was lucky in his choice of sun glasses. He might have chosen blue ones, which could easily have transmitted dangerous amounts of ultraviolet between 300 and 400 nm while appearing quite dark enough. Green glasses such as those worn by De Saussure would of

course not be considered adequate nowadays, when the glasses used by policemen, soldiers, sailors and airport control officers have to be neutral in colour, opaque to ultraviolet radiation, and with infrared transmittance no greater than that in the visible.

Footnotes

[1] See D. W. Freshfield, *The Life of Horace Benedict de Saussure*. London, Arnold, 1920.

[2] A. M. de Rochon, *Recueil de mémoires sur la mécanique et sur la physique* (Paris 1783), pp. 348–55. This was also published at Brest in the same year, but remained little known.

[3] W. L. Wolfe and G. J. Zissis, *The Infrared handbook*, Washington, D. C., 1978.

[4] Optical Society of America, Committee on Colorimetry, *The Science of Color*. New York, Thomas Y. Crowell Co., 1953, Chapter 8.

Zusammenfassung

Der Autor ist bei einem Besuch im Genfer «Musée d'Histoire des Sciences» aufmerksam geworden auf eine grünlich gefärbte Sonnenbrille aus der Hinterlassenschaft von De Saussure, die dieser für seine Bergtouren benützte, also wahrscheinlich auch bei seiner berühmten Besteigung des Mont Blanc von 1787. Er hat diese Gläser auf ihre optischen Eigenschaften geprüft und gefunden, daß sie ihren Zweck recht gut erfüllten, vor allem einen guten Schutz im ultravioletten Bereich gewährten.

Prof. Dr. W. E. Knowles Middleton
Apt. 2406
2020 Haro St.
Vancouver, Canada V6G 1J3