

A COMPARATIVE STUDY OF
BAUSCH & LOMB'S RAY-BAN AND I'S SUNGLASSES

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Plano sunglasses play a significant role in the optical industry, with almost 2.7 billion dollars in sales in 1994¹, or approximately 5.8% of the total U.S. optical retail market². Bausch & Lomb has played a major role in the field for over 50 years with the sales of its Ray-Ban sunglasses, which became available to the public in 1936. Over the years, Bausch & Lomb has introduced many different frame and lens styles to the Ray-Ban series. In fact, the Ray-Ban G-15 lens is the best-selling sunlens in the world³. Ray-Ban sunglasses are well known for their high quality optics, materials, and workmanship, and thus tend to run in the moderate to high price range (\$40.00 to \$200.00+), a bit more than a lot of consumers wish to spend.

Recently, however, Bausch & Lomb has introduced a new line of sunglasses, separate from the Ray-Ban line, which generally run in the \$30.00 to \$40.00 range. This line of sunglasses is known as I's and is billed as "affordable (sun)glasses for the masses", with "B & L written all over it. Pure optical glass lenses, ophthalmic quality fit and comfort. 100% UV protection with superior glare control and so much more.⁴" Yet if these sunglasses actually cost that much less than Ray-Ban, can they really be of similar quality. That is the focus of this paper.

When I began writing this paper, I expected to get a lot of assistance from Bausch & Lomb regarding frame materials, manufacturing process, etc... On the contrary, they were very *unwilling* to give out much, if any, information on technical data on Ray-Bans, although they did send a packet on the history, types of lenses available, etc...; ie., information for optical salespersons to tell prospective consumers. I was told by company representatives that Ray-Bans are, at least, made in the USA, although they would not even tell me which state (their world headquarters are in Rochester, NY). They were excited when I began to ask about the I's line, but quickly

began silent when I began asking specific details. For example, they would not confirm or deny whether they were even made in the USA. I found out later, through a Bausch & Lomb sales representative, that the frames at least are made in China; this was confirmed when I looked at one of the newest frames to be released, and it stated "Made in China" right on the frame (this was missing from all earlier models). I still have been unable to determine if the same is true for the lenses.

In speaking with a B & L representative, one of them did confirm that the glasses are, technically, not even manufactured by Bausch & Lomb. That is, they are made by an outside source and merely marketed/distributed through Bausch & Lomb. When they were originally introduced, they were distributed under the "Levi's" (as in jeans) logo, later being changed to just I's. When I inquired about the company which actually manufactures the sunglasses (ie., Who are they? Where are they based? May I contact them regarding I's sunglasses?, etc...), I was told by the representative that they "would check on that and call me back". Eight weeks later, I'm still waiting to hear from her.

What I find more frustrating than anything else is the secrecy behind the entire matter. I can understand not releasing information regarding specific alloy make-up, or specific manufacturing techniques, but I was just asking general information. Are they embarrassed by the sunglasses themselves because they are a clearly inferior product, or do they just want to protect the conception that they are just as good as Ray-Bans but less expensive. By reading the promotional materials, one could easily get the impression that I's are even made in the same factory as Ray-Bans.

ANALYSIS OF CHARACTERISTICS

In analyzing the sunglasses, I decided to focus my study of Ray-Bans to

those with G-15™ lenses, the mainstay of the brand, to limit the scope of this paper. I studied both the grey and brown I's lenses, the only two available at this time. I studied a variety of frame types for each line, with different materials (plastic, metal, and combination), as well as various colors and styles.

There are several attributes which should be addressed when analyzing the quality of a sunglass lens. According to Pitts, the ideal or optimum sunglass lens should provide the following characteristics⁵:

1. Reduce the solar ambient luminance for optimum visual comfort and visual performance.
2. Elimination of the optical spectrum not required for vision that serves as a hazard to the eye.
3. Maintenance of optimum dark adaptation or night vision.
4. Maintenance of normal color vision, especially for traffic lights.
5. Minimum care and increased resistance against impact and scratching.

In addition, I feel that there is a sixth category that should be included in this list:

6. Sun lenses should be made of high-optical-quality materials, free from unwanted power, prism, and imperfections.

The American Optometric Association states that sunglasses should screen out 75-90 percent of visible light for optimum visual comfort and performance⁶. Using a UV-meter, I measured the following absorbance percentages:

	<u>Ray-Ban</u>	<u>I's</u>
1.	87R/87L	77R/77L
2.	84/84	78/78

3.	83/83	85/87
4.	85/86	86/86
5.	85/84	86/86

While all of these are within the AOA guidelines, there was more variability than I expected, especially with the Ray-Ban G-15 lenses (all of which I expected to be 85%).

The second characteristic (ie., eliminating the optical spectrum which may damage the eye) refers primarily to the blockage of ultraviolet radiation. Several studies have shown UV to be damaging to ocular structures, including the cornea⁷, the conjunctiva, the lens⁸, and the retina⁹. Using the same UV-meter, as well as a Beckman DU-640 spectrophotometer (see Table 1), I measured the following ultraviolet 380nm transmittance:

	<u>Ray-Bans</u>	<u>I's</u>
1.	0 R/0 L	0 R/0 L
2.	0/0	0/0
3.	0/0	8/9
4.	0/0	8/8
5.	0/0	8/8

While I was not surprised that all of the Ray-Ban G-15 lenses blocked 100% of UV radiation below 380nm, I was surprised that only the *brown* I's lenses did so. The I's sun lenses which were grey in color transmitted about 8% UV at 380nm, and around 12% at 400nm. I was aware that grey-ophthalmic crown lenses have a characteristic jump in the transmission curve at around 400 nm, but I also thought that the lens material would have an additive to prevent this. As the spectrophotometer graph shows, the UV transmission for the grey I's lens does not drop to zero until around 350nm.

While there is evidence of the damaging effects of infrared radiation in

high intensity, short-term exposure¹⁰, there is no conclusive evidence that ambient solar IR radiation over long periods is damaging to ocular tissues¹¹. Even so, Bausch & Lomb states that Ray-Ban G-15 lenses are "especially effective against these rays"¹². I was unable to confirm this, or check the I's lenses, with the spectrophotometer.

The next characteristic, maintenance of optimal dark adaptation for night vision, has been found to be most effective with sunglasses with a luminous transmittance of 12-15% (ie., 85-87% absorbance) ^{13,14}. Using this guideline, only the Ray-Ban G-15 and the I's grey lens would meet the criteria; the brown I's would not. This characteristic would be most important for those with critical night vision needs, such as pilots, police, astronomers, etc., and would not be too important for the *majority* of individuals.

The next characteristic, maintenance of normal color vision, is important for the majority of individuals, especially if it interferes with the interpretation of traffic signals. This is especially true for color-deficient individuals. Color recognition tasks clearly demonstrate that neutral grey is the color of choice, with the brown tints being next. Neutral lenses prevent color distortion because they transmit almost evenly across the visible spectrum¹⁵; thus, they appear grey in color. To investigate the possible effects on color vision, I tested a normal trichromat using Ishihara pseudo-isochromatic plates wearing each of the three types of lenses (G-15, brown I's, and grey I's); none of the lenses were found to have any effects on color discrimination; i.e., the individual did not miss any of the plates while wearing any of the lenses.

An optimum sunglass lens would also be impact resistant, in accordance with FDA regulations, ie., be able to withstand the force of a 5/8" steel ball dropped from a height of 50". While the FDA requires that **all** prescription glass lenses be *individually* tested, they do allow the impact resistance of both

plastic *and glass* nonprescription sunglass lenses to be tested by statistical testing of batches¹⁶. Bausch & Lomb insists, however, that each and every one of its sunglass lenses is tested at the lab¹⁷. Due to four years of optometry school tuition and fees, this reseacher will take their word for it, rather than verifying this for myself.

Pitts also recommends that sun lenses require minimal care and be resistant to scratching. All Ray-Ban G-15 lenses as well as all I's are made of ophthalmic crown lenses which are inherently resistant to scratching.

Finally, sunglass lenses should be of high optical quality, free of unwanted power, prism, or imperfections. To check for any unwanted power in these plano sun lenses, I placed each lens on a Humphrey Auto-lensmeter. Each and every lens in both the Ray-Bans and the I's read plano (0.00D) power. I then placed each lens into a Marco lensmeter (after calibration); again, I could not find any unwanted power *or prism*. To inspect for imperfections (waves, pits, etc.), I held each lens at arm's length and moved it across the straight edge of an ultraviolet ceiling light fixture. I was unable to find any deformities in any of the 20 lenses inspected. All lenses of both Ray-Bans and I's appeared to be of excellent optical quality.

Another property that a quality sunglass lens should have is homogeneity and consistency between lenses in the same frame, as well as different frames with the same type of lens. To judge this, I analyzed each lens through the Beckman spectrophotometer, measuring its transmission curve over the 300nm to 800nm spectrum. Each lens of each variety (ie., Ray-Ban G-15, brown I's lens, and grey I's lens) exactly matched the others of its group. The transmission curves of each type of lens are shown in the following table:

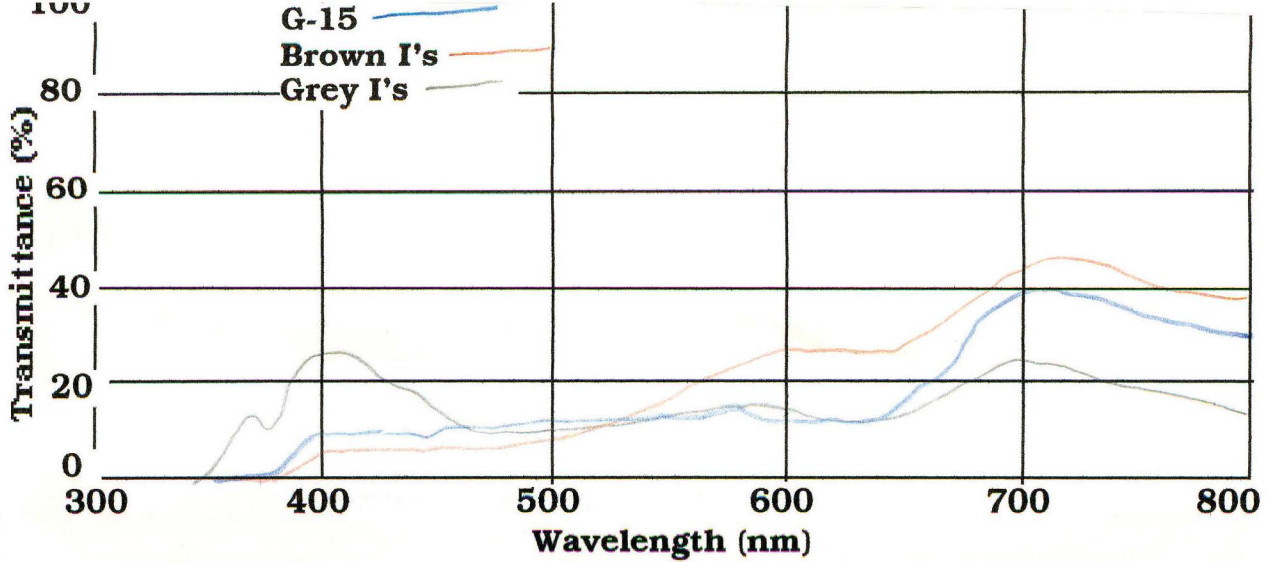


Table 1: Sunglass Lenses Transmission Curves Using Spectrophotometer
As you can see, the transmission curves are not as we would expect

theoretically, i.e., they are not a *straight* line right at 15% transmission for the G-15 lens--there is actually considerable variation across the spectrum.

However, there is a *very* high consistency among lenses of the same type.

Bausch & Lomb is very proud of the precision and quality which goes into its Ray-Ban frames. From the frame finish to the nose pads, every piece is carefully designed and manufactured. In fact, the frame quality seems to be the biggest difference between the Ray-Ban and the I's. Let me begin with the finish. The majority of Ray-Ban have a gold finish (trademarked 'Arista') where 24 K gold is actually electroplated over a core alloy frame, giving the frame both strength and resistance to corrosion. The gold apparently makes the frame hypoallergenic and prevents corrosion of the core frame materials, but is mainly used for appearance and prestige reasons nowadays. The finish can thus last several years without tarnishing or wearing off¹⁸. I am unsure what type of finish is used on the I's (the company would not tell me), but an optician at a retail store told me that customers have complained about the frame finish wearing off of the metal frames, especially along the inside of the temples where the frames tend to rub against the head. There also appears to be an enamel coating over the solder joints on the I's, which brings up my next issue. All joints on the Ray-Bans are finely finished, without any excess solder showing. I's, on the other hand, have very obvious excess solder at the joints,

especially where the bridge and the guard arms are mounted to the frame front. Another nice feature of the Ray-Ban frames is that almost all of the metal frames have 'double screws' holding the lens in (ie., the endpiece screw and the temple screw) to keep the lens from popping out should one of the screws get lost; none of the I's that I saw had this feature. As for as the plastic frames, again there are several areas of superiority of the Ray-Ban frames (which are made of cellulose acetate or nylon). The hinges themselves are built much sturdier (often with 3-4 barrels rather than just two), but the main differences seem to be how the hinges are mounted to the frame itself. On the I's, it was fairly obvious where the hinges had been 'melted' into the frame. On the Ray-Bans though, the mounting areas appeared to be pre-recessed. More importantly, on the Ray-Bans, the hinges had shafts which would go all the way through the frame to mount to a hinge *front* which was mounted through the front of the frame. The hinges on the I's were melted nearly half the way through the frame front, which could come loose if the temple were bent, hit, etc... The Ray-Bans also had much smoother finishes than the eyes; in fact I could not even find the mold markings on the Ray-Bans. (Ray-Ban plastic frames are tumbled in drums filled with wooden pegs for up to four days to give the frame a smooth, hard finish [8]). The bottom line is that, upon close inspection, the Ray-Ban frames are far superior to any of the I's frames and would definitely last much longer under equal conditions.

So why would Bausch & Lomb want to sell the I's line if the frames are obviously of inferior quality? The answer is fairly obvious: they want to expand their market share to include those who are not able (or choose not) to spend \$50.00 or more on sunglasses, but want the optical quality similar to that found in Ray-Bans. Ray-Bans are aimed at the youthful, fashion-conscious professional who feels that B&L is a reputable firm with quality

products²⁰. The I's buyer is younger and not as well established, but wants the appearance, lens performance, and protection similar to Ray-Bans. They are the ones that B&L hopes will be willing and able to purchase Ray-Bans within a few years.

In conclusion, I feel that the quality of the I's *lenses* (regarding optical quality, impact resistance, blockage of harmful rays, etc.) are very similar to those of Ray-Bans, but the *frames* are far inferior. Perhaps this is a major reason why the company is not willing to discuss any details about the I's. I feel that B&L has contracted to have the frames made cheaply in China to be able to sell them at a much lower price, using the reputable Bausch & Lomb name to increase their market share (and profits) by targeting a younger, less affluent clientele. However, while Ray-Bans will continue to dominate the sunglass market, I believe that the I's line will allow Bausch & Lomb to serve a new niche whose needs were not previously being met by them.

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