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For Debate

Full View of the Road

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The nights are lengthening again and with them, the number of problems associated with driving in the dark. The fact that the accident rate is twice as great during hours of darkness as during daylight has never been pinned down convincingly to purely visual causes. Nevertheless, according to one estimate[1] some 40% of accidents are due to visual impediments, and it would therefore be hardly surprising if safety were to demand that the available light reaching our retinae should be maximized both for the driver's safety and that of anyone likely to come into contact with his car. In fact, improvement in illumination leads to significant reductions in accident rates.[1] The Motor Vehicles (Construction and Use) Regulations 1973[2] devote two and a half lines to the problem. Section 22 states: "Every motor vehicle shall be so designed and constructed that the driver thereof while controlling the vehicle can at all times have a full view of the road and traffic ahead of the motor vehicle."

While this statement rules out mascots dangling in front of one's eyes and prohibits split windscreens, it leaves the term "full view" undefined. In a physiological sense "full view" ought to mean that the driver's visual field in the intact car would remain unchanged if the car dissolved away with the driver remaining in the same position. A reasonable man will argue that the loss of light entailed by the use of a windscreen is worth the mechanical protection it affords. Having said that, however, he might concede that the visibility through such a windscreen ought to be maximal so that Section 22 could be obeyed as nearly as possible. It is frequently overlooked in this connexion that the fullness of the view can at all times be impaired in one of two (or both) ways: a beam of light can be reduced in intensity (*a*) by an obstacle which forms a shadow, or (*b*) by so-called amplitude splitting, as typified by sunglasses and filters of all sorts. Thus the law seems to concern itself only with (*a*). The uncontrolled use of tinted windscreens, and of spray-on varnishes falls under (*b*).

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The law never seems to have received advice from visual physiologists, for it ignores the fact that night vision differs drastically from day vision. If anyone doubts this let him try to read any numberplate at a distance of 25 yards (22·8 m) in the dark—even if it is illuminated. While there is more than enough daylight to allow normal eyes to operate at a level of high efficiency insofar as the processing of visual information is concerned, at night this performance hovers near the threshold. Richards has shown in numerous publications[3] that any amplitude splitting of the light reaching the eye lowers visual performance.

Thus, though the use of tints may be tolerable and in some cases desirable during daylight hours, this is no longer the case at night. From a physiologically sound point of view, tints, sprays, and filters ought to be removable because during the day they may contravene Section 22, and at night they do so without question. The problem of what fraction of the incident light a windscreen ought to transmit is undecided, and the Department of the Environment is awaiting the outcome of discussions with other member countries of the European Economic Community.[4] But it would be wrong to consider the problem in relation only to cars, for what matters is the light reaching the road user's eye or, more precisely, his retina.

If this is accepted then guidelines or even legislation regarding driving in the dark ought to be concerned with any transparent surface placed between the driver's eyes and the road. It is recognized, for example, that only clear, or, at worst, lightly-tinted contact lenses ought to be worn at night.[3] The use of yellow, or any other antiglare glasses cannot be justified on any rational basis. The latter are recommended on the grounds that the wearer is protected from the glare from the headlamps of oncoming vehicles—which would otherwise reduce his dark-adapted sensitivity—but they also reduce the intensity of useful light which he may need to detect barely visible obstacles on the road.[5] Aguilar and Stiles[6] have shown that the light needed to reveal contrast is reduced with the general level of illumination when one is dealing with large target areas. But this is not true near the lower limit of the range described by Richards[3] as useful. At low levels of illumination the light needed to reveal contrast reaches a constant value: if this is reduced—for example, by the driver wearing antiglare glasses, he will fail to reach the threshold of vision and miss the potentia hazard.

Motor Cyclists

Visors worn by motor cyclists also fall into this category and, if tinted, constitute an unnecessary hazard at night. The British Standards Institution[7] has considered the matter superficially in its Specification for Motor Cyclists' Eye Protectors. The lenses—that is, the parts of an eyeprotector through which the wearer sees an object—shall transmit not less than 80% of the light that is transmitted by a gas-filled tungsten filament lamp operating at a colour temperature of 2854° K. There is no technical reason why the transmittance should not be higher in protectors worn at night. It is noteworthy that the prescribed minimum transmittance for windscreens reaches the level of 80% only in Australia. It is lower than this in the United States and in Germany. When one considers that older eyes need more light than young ones to compensate for normal senile ocular light losses,[8] and that the average car driver is older than the average motor cyclist, then this discrepancy is odd. It is based probably in part on commercial considerations, but in so far as low-transmittance materials are safe during daylight hours there is no medical ground for objection. Every effort should be made, however, to educate the public to treat them as unacceptable in the dark. In practice they should also learn that irremovable tints ought to be considered as inadmissible.

It also follows as a corollary that all transparent screens—windscreens, visors, spectacle glasses, and contact lenses—used at night should be clear, and that any light filtering required during daylight should be provided by accessory but removable means. Published figures[9] lead one to conclude that the accident rate varies inversely with illumination when this is low. This means, in figures, that, if the countries of the E.E.C. agree to the 70-75% accepted in the U.S. and Germany, the accident rate during the hours of darkness can be expected to be some 15% higher than it would be if the minimum transmittance for a suitable standard light were at least 85%. If the annual traffic fatalities in this country exceed 6,000 and two thirds occur in the dark then a maximal increase in the transmissivity of protective screen surfaces may save many lives.

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Outside Medicine

Thomas Young

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Thomas Young was one of the foremost natural philosophers of the first three decades of the last century, and in his achievements ranks with Sir Isaac Newton as one of England's most brilliant sons. By the range of his investigations Dr. Young belongs to the eighteenth century; by his discoveries he is a link between the scientists of his time and those of today.

He was born at Milverton near Taunton on 13 June 1773, the firstborn of 10 children of Thomas and Sarah Young—prominent Quakers. Under his parent's training and example he developed character qualities of dignity, reserve, and industry, for he says "the principles which I imbibed and the habits I formed under the guidance of these dear and excellent relatives have more or less determined my character in future life, whatever it may be." Beginning as a child prodigy he continued his early promise, becoming eminent alike in the sciences, medicine, and classics besides being a unique civil servant. He read fluently at the age of 2 and at 4 had read the Bible twice. His grandfather records that before his fifth birthday he repeated from memory Goldsmith's *Deserted Village*.

After about six years' schooling his education was continued under a private tutor appointed by the wealthy Norfolk Quaker merchant David Barclay, whose grandson, Hudson Gurney, was to join him in his studies and they became lifelong friends. Young soon outstripped John Hodgkin, the brilliant classical tutor, and so really trained himself and his friend. By 19 he had a profound knowledge of the classics, Hebrew, French, German, and Italian, the grammar of oriental languages, and he had also mastered Newton's works and those of current French philosophers. He was practical too, could turn a lathe, grind lenses, produce drawings, bind books, and he made a number of scientific instruments.

Medical Training

It was through Young's uncle, Dr. Brocklesbury—a prominent London physician—that he decided to train as a doctor, entering the "Hunterian School of Anatomy" in 1792 and a year later becoming a medical student at St. Bartholomew's Hospital. He was fortunate in moving in the circle of his uncle's friends Edmund Burke and Sir Joshua Reynolds. In May 1793 he read to the Royal Society his first major contribution entitled *Observation on Vision*, dealing with his theory that the crystalline lens could change its power

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