Summary of the Vision in Vehicles VI Meeting

September 13-15, 1995 in Derby, England

Paul Harris, O.D., F.C.O.V.D., F.A.C.B.O.,F.A.A.O.

First paper: Michael Sivak, "The information that drivers use: is it indeed 90 per cent visual?", Transportation Institute, Ann Arbor, Michigan.

He asks: "What percentage of drivers problems are visual?" Quite a few of the previous papers at this meeting and the papers in the literature are very specific about the number 90. His presentation was about where did that number come from and was there any support for this number or should the number be different.

It is agreed that vision is the most important sense (process), but how much more important? One question he asked was, "Is it even important to quantify it beyond this?" First, after extensively tracking down references, he found that no author ever had direct "proof" of the 90% number. Many authors relied on other authors and when tracked down into their cited references, he found that either they relied on other authors, who were subsequently tracked down through their citings, or they made statements without support. Sounds like the quote used all the time in optometry, "85% of all that's learned is visual." (and all the variations on this theme.) He then talked about the word "information", for which he said there was no good definition. Are we talking about all the available information, all the information that gets into the input senses, or all the information used? He stated that one definition of information is that which drivers use to reduce their level of uncertainty (Heisenberg Uncertainty Principle). This then would state that measuring things in the environment will never be enough and can not be used for exact quantification. He then performed 4 different evaluations of how much vision may be involved. These involved numbers of citations in the literature and how many of our states in the US test for vision, versus testing any other sensory system, a survey of how cars are designed to screen out other sensory data versus vision, and finally a task analysis method looking at specific categories of the types of activities that drivers have to do. He then rated the tasks as being visual, auditory, kinesthetic, etc. Eighty three per cent were visual. All the other ways were higher. Therefore, he stated that the number may not be exactly 90%, but varies from 83% to a high of 96%.

****

J. Bloomfield, "Human factors aspects of the automated highway system: the driver's response to decreasing

vehicle separations during transitions into the automated lane", University of Iowa

They demonstrated their simulator, which is a full car interior that is part of a system similar to a plane simulator. It can tilt and turn the vehicle to simulate many of the kinesthetic aspects of driving. They project 192 degrees in the front field and 65 degrees behind and can simulate as many as 20 other cars in the environment. They then looked at the level of comfort people had with automated lanes, which are designed for high speed, highly packed traffic, controlled by the road and computers in the car. The problem here was how will people in the automated lane react to others coming into the lane at speeds different than the lane is moving and how they will react to the automated merge in process. NOTE: The cars travel as fast as 90 miles an hour with one meter between vehicles! Nearly 85% showed tremendous anxiety and discomfort with the merge in process. At first they were comfortable moving along in packs of 4 cars at 95 mph. They were in the lead car and the process had the new car coming into the automated lane and their car forming up on that car to within 1 meter while traveling along at 95 mph. They did 4 trials with each person varying a number of factors. Older people and women had more discomfort with the process. However, even 50% or so of the young men experienced anxiety with the process, which remained at nearly the same level for all 4 trials.

****

Helmut Zwahlen, "Driver eye scanning behavior when reading symbolic warning signs", Athens, OH

He recorded eye movements in people as they drove rural Ohio roads that they had not driven before. The issue is what is the proper size and reflectance for the signs. When do people first look at the signs? When do they last look at signs? On average, how many times do they look at signs? He looked specifically at signs that warn that a curve is approaching. The roads had 55 mph normal speed and had hard curve and gentle curve signs. Some signs had speed warning placards below the curve warning with different numbers. His data supported that the speed placards were not looked at directly and had no effect on peoples actual speed in driving the curve. I contested the fact that the speed placard actually has to be looked at to be seen. He was set in a bottom up mode and could not see that there might be some top down types of processing here. I mentioned the work by Goolsby in music, in which sightreading of music was the task and many parts of the music were never foveated, but were done and were taken into account. He dismissed these, stating that the numbers could not be read while fixating the sign proper and that there was no evidence of a second fixation. I disagree and feel that the numbers are seen and are taken into account while not needing to be foveated due to top down processing and the fact that the numbers are well above threshold visual acuity and can be seen parafoveally. Some interesting info: A warning sign is normally looked at twice. A stop sign during a stop is looked at 7-8 times! We see the color of a sign two times further away than we recognize the shape of the sign. The fixation duration on a sign is shorter at night than at day. He was a bit amazed by this but I was not. There is simply a better signal to noise ratio built into the scene which requires less processing at night to extract the sign from the scene. The duration of fixation times were about .5 seconds in day and .4 seconds at night.

****

Andrew Liu, "Modeling changes in eye fixation patterns while driving", Cambridge, MA

He had a rather crude but operational simulator. They were looking at not just where do people look most of the time while driving, but rather what pattern(s) do they follow. Instead of just "where", they are trying to figure out if once a particular place is looked at, is there a higher probability that they will look at other parts of the visual field. They used a type of statistical analysis that I was unfamiliar with, called Markov matrices. After looking at these a bit I began to understand them fairly well. I found it interesting but it is in the very beginning phase and I don't think that they had any real insights to glean yet!

****

Day 2 Thursday 9/14/95

Michael Land, " Which part of the road guides steering?", Sussex Center for Neuroscience, Brighton UK

. If the demand of the road is high (difficult), then clear patterns do reveal themselves. He used a video setup which splits the video recording field using a single camera. The upper 2/3rds is used to record the scene and the lower third records the eye movement. On the scene you have a marking on the windshield which gives the position of the head when marked from frame to frame. Testing was done on a lone closed single-lane one-way mountain road. To analyze, digitize the eye point after calibration on a frame by frame basis and then replay and analyze. Results: We look within 1 to 2 degrees of the tangent point of the curve. Vision leads steering by .75 to 1.0 seconds. He had also obtained information from the recording of the steering information from a specially modified car. Conclusion: Two points are used. The tangent point for guiding through the curves and a near point to the sides of the road peripherally to center the car in the lane.

****

J. Louma, from Finland, "Effects of driver-side mirror type on lane-change accidents." Research done at University of Michigan

Looked at data for Finland on lane-change accidents on different types of driver side mirrors. The mirror on the right side was always convex. The driver side mirror was either flat, convex or multi radii. There were more accidents with the flat mirror on the left only. No data exists for flat mirrors on the right side, which the rest of Europe has in some (I don't know percentage) cars. I mentioned information about perceptual effects of mirrors in terms of SILO and SOLI, as well as mirror projection work.

****

Louie Nunes, "Effects of distance and speed in the time to arrival estimation in an automobile: two classes of time?", Faculty of Psychology, University Complutense, Madrid, Spain.

We all know that D=R*T from physics. This paper dealt with estimated versus real time. ET = f(RT) Estimated time is a function of real time. ET = f(S,D) Estimated time is a function of speed and distance. The experiment was to see what role speed and distance played in estimation of time to arrival. The person is a passenger in a car moving toward a barrier at the side of the road. The person sees the barrier as they approach. They are wearing LCD goggles which are set in the open position at this point. As the passenger approaches the barrier the LCD shuts down and the person must hit a button when they think that they would be right next to the barrier. They varied the speed of the car and varied the distance away from the barrier at which the LCD windows shut down.

They also did a procedure in a lab with a computer screen. Here they had an object moving across the computer screen from left to right. On the right side of the screen is a rectangular box through which the moving target would intersect as it moves from the left to the right. At the moment the spot intersects with the box, it is removed from the screen. The person must hit a button at the time they think the spot would emerge from the right side of the box. This is similar to some of the Optomatters type of computer vision training. They found that the person was pretty accurate in the lab setting but in the driving condition they nearly all hit the button BEFORE the time it should be hit to have been perfectly even with the barrier. The equation that was a best fit was: ET = (0.92 * RT) - 0.75 seconds It was postulated that the foreshortening of the time was related to a safety factor. I thought that it might relate to lack of experience with collisions and that all they knew was the time it would take to initiate a collision avoidance action. Another form of the equation as they factored in distance and time was the following: ET = 0.66 * (D1.22 / S 1.30) It was clearly stated that the lab experiment does NOT predict performance in the real world setting.

****

V. Cavallo, "Visual information and perceptual style in time-to-collision estimation", INRETS, Salon-de-Provence, France, Departement Mecanismes d'Accidents

This was an interesting paper in which they used a simulator with 5 different types of representations on the screen. It was a very basic simulator of just a single large TV screen, during which eye movements were monitored. The image presented varied from a single car, to a car with a road (shown just by edges), a car with a road with fence posts next to the road, a car on a road with texture on the road, a car on a road with texture on the road and fence posts along the road. They found that there were two types of people that performed very differently, depending upon field dependence versus field independence. (This is more of a psychological differentiation with which I am only peripherally familiar.) They found different safety margins with members of the two different groups. The key factor in the simulator related to the use of the texture and how this helped a person understand "optical tau". This is a quantity that I learned relates to the texture flow in the visual flow. The term optical tau was coined by a VIV attendee in the past and appears in the proceeds of previous meetings. It turns out that speed had no bearing on Time To Collision (TTC) in a visually rich environment.

****

P. Cairney, "Real-life night-time performance of lights and reflective devices for cyclists", Australian Road Research Board, Nunawading, Victoria, Australia.

6% of accidents with bicycles occur at night. 32% occur at dusk or dawn. Of the dusk/dawn accidents 11% are hit from the rear, 27% from the side and 13% after a turn from the frontal side area. They set up several (8-10) bike riders along a prescribed car path in country and town routes. Subjects were told to look for and identify the bicyclists that they saw along the route. The cyclists were set up on stands at fixed positions and sat in positions as if they were riding. Distance from the site of the cyclists was measured by an interesting device. A marker was placed on the rim of the tire. A device was used that sensed the marker every time it rolled past the device. When the driver indicated that he had seen the cyclist, he pressed a button which activated a counter that counted the number of tire rotations until contact. For consistency with the testing conditions in each trial the bikers were all stationary. Findings: Flashing tail lights were four times more visible than a plain red light. Front lights were all found to be ineffective in helping the bicyclists to be seen and the group brain stormed some possible ways to improve visibility of cyclists. Interestingly, the flashing back lights are not legal. Since the early release of the information about the increase in visibility in Australia, the police have officially stopped enforcing the ban on blinking back lights. No solution to the front light problem was found. Reflective strips anywhere (bike, person, helmet, etc.) were all deemed to be ineffective in mesopic conditions.

****

M.P. Langham, "The effects of cognitive style in a laboratory investigation of motorcycle conspicuity", Cognitive & Computer Sciences, University of Sussex, Brighton, UK

This paper dealt with conspicuity of motorcycles in different conditions. Broadcast quality videos were taken of motorcyclists in various situations which were then shown to a number of subjects to determine what factors led to the motorcycles being seen. The highest trends that were identified by this researcher leaned toward the perceptual--cognitive styles of the people viewing the tapes rather than any specific factor on the tapes! Here we are back to the field dependent and field independent concepts again. The field dependent people were slower in identifying the motorcycle than the field independent viewers.

****

Lenny Stapleton, "Automotive contact analogue Head-Up-Display images and distance estimation", HUSAT Research Institute, Loughborough, UK

Here the idea is to use the heads up display to enhance the view of the road conditions in front of the driver to help them in conditions of poor visibility. The system that they were looking at was an infrared system. Their HUD design used the windshield as the collimator (that which the images are projected onto). The image was put directly in the line of sight of the driver, overlapping the real scene to enhance the driver's view of the scene in front of him. Their HUD used a two dimensional view projected at a fixed focal plane. The first set of problems that they dealt with relate to accommodation and convergence relative to the HUD image. The term used is "accommodative micropsia". This refers to a phenomenon noted that, when looking at a HUD image that is at a fixed distance in front of the driver overlapping the real scene which is further away in space, the size perception of the objects from the real scene are generally perceived as being smaller than they are in reality. Another concern was the possible shift towards the dark focus point at night, particularly with the HUD images being at or near some peoples dark focus point. The study did show that the HUD affected drivers perception of where objects were in space, systematically bringing objects perceptually closer to the driver.

****

Paul Barham, "Evaluation of the human factors implications of Jaguar's first prototype near infrared night vision system", Cranfield Centre for Logistics & Transportation, Cranfield University, UK

Here a standard issue military infrared HUD was mated with a Jaguar car and used in several experiments. The study was on a drivers ability to detect a walking pedestrian in a typical street scene. The car was parked in a position where a long section of roadway was visible. This was a crowded urban residential street with 2 street lights. The pedestrian entered the street 160 meters away and walked the same path towards the parked car with the subject in it. The distance that the subject first reported the presence of the pedestrian was recorded. The subjects were told to look for the pedestrian. The average person saw the pedestrian at between 50-70 meters away without the HUD. Four of the subjects without the use of the HUD did not see the pedestrian until the pedestrian was 20-23 meters away! These four subjects were VERY different than the main group. NOTE: These four subjects had legal licenses to operate motor vehicles in the UK and met the visual acuity and visual field requirements to still be driving. Next the HUD's were turned on and the trials run again. I do believe that there was random ordering with different subjects to make sure that they were not just getting practiced and as many as 4 trials in each condition were done. With the HUD on, the normal range at which the pedestrian was sighted was now 90-100 meters. The net increase in distance sighted was 36.4 meters. NOTE: The people were allowed to adjust the view in the HUD to their liking in terms of how the view from the HUD fit into the overall scene. The key to me was the performance of the 4 very poor viewers in the non-HUD condition as they put on the HUD. All 4 had their distance to picking up the pedestrian increase dramatically, all the way from the 20-23 meter distance (which is shorter than the stopping distance of most cars moving at 35-40 mph) to the same range as the rest of the group of between 90 and 100 meters! I felt that the simple test of looking for the pedestrian in a scene like this might be a way to detect drivers who are at risk in driving.

****

James Wolffsohn, " The effect of viewing monocular and binocular car head-up displays on response times and ocular accommodation", Department of Optometry & Vision Sciences, University of Wales, Cardiff, UK

This young optometrist shared his research work during his last year at the university. Several HUD displays were used, which projected their images at different fixed focal planes. The GM system uses 2.4 meters. Other manufacturers used from 1.7 to 7.8 meter projection distances. Average dark focus dioptric powers are 0.83 diopters with a fairly wide variation. The fear is that the HUD at or near to a persons dark focus distance will cause the person to shift the posture of their accommodative mechanism to the dark focus position and therefore be unable to look all the way out to the distance scene when needed. Testing here was done in a lab with many controls over the view of the scene and the lighting conditions. 14 subjects were used. Testing was done in what they call a "pseudo-binocular" testing situation. Both eyes were open. The HUD image was placed before one eye. The HUD was projecting some car control information, such as speed and engine RPM. The image was aligned just off center, away from the direct line of sight, but very much towards the middle of the scene. The subjects viewed a complex driving scene on a view screen placed far in front of the driving simulator. A traffic light was viewed straight on and served as the distance fixation point. Reaction times were tested based on changes in the distant traffic light as well as changes in the HUD readouts. A modified Cannon auto refractor was used to monitor the posture of the accommodative mechanism.

Findings: No changes in overall reaction times were noted in the distance task,no matter where the HUD was focused. Reaction time to changes in the HUD while looking out at the distance targets was .60 seconds slower. No changes in the posture of accommodation were seen with the HUD set at different distances! Therefore, the fear of the HUD's causing people to involuntarily fixate at the HUD and lose the ability to shift out towards the distance target is unfounded. The study did show that when asked to look directly at the HUD image as a primary image, distance view shut off, that the HUD image was a good stimulus to accommodation (meaning that the level of accommodation measured by the auto refractor in this situation correlated highly to the actual projection distance of the HUD.). When the distance scene is viewed binocularly, no shifts in the level of measured accommodation were seen towards the HUD image. They did find that when the subjects were asked to concentrate on the HUD image, some loss of information processing of the distance scene was noted. The presenter recommended that the HUD should be at least 1 meter or more out in front of the driver.

****

Workshop - "Visual Standards in Driving", Chaired by Peter Smith an Optometrist from the UK

This section of the meeting was by invitation only and had only about 25 people involved in it. I was able to get myself invited and I'm glad I did. The first part of the morning included a series of presentations by different attendees. The following is a summary of these presentations: Dr. Steve Taylor (UK optometrist) is the chairman of the standards group in the UK which meets every year. The point was made that every attempt to find a simple test which would separate safe versus unsafe drivers has failed. There is no direct link between tests of (low level) vision and driving safety, even though it is fully understood that vision is the key factor in driving. 8-9% of people with licenses in the UK do not meet the visual acuity standard of 6/10. Many of these are people who need glasses to achieve 6/10, but choose to not wear them. Others are those whose sight has dropped to less than 6/10 since they got their license. A simple behavioral survey done on optometric patients in the UK showed that myopes do not complain of more night vision problems than non-myopes.

Next was a presentation by a UK Ophthalmologist involved for many years in the vision standards issues. He spent a good bit of time on the visual field requirements and his role in developing these requirements and his view of the law and those who make the law. They state (condensed) that any hemianopsia and any quadrantanopia which extends to within 20 degrees of fixation is a restricting factor. Their standards were established using Goldman 3,4E settings or the equivalent using automated perimetry. An Australian optometrist presented an interesting paper on the different visual standards for citizens in the different states in Australia. These include the following: VA must be "correctable" to at least 6/12. If the person who was binocular loses one eye, their license is suspended for 3 months. These people must have 2 mirrors on their car. She discussed the fact that some of the states have mandatory road tests, either yearly or every other year after the age of 70 or 75. This was an interesting concept.

A Dutch physician involved in research was next. He discussed much work that he and his colleagues are involved in. He discussed the "U" shaped curve which relates death risk to age. At very young age and again in the older population there is increased risk per mile driven. In fact in the oldest sector researched, the risk per mile driven is worse in the older group than in the newly licensed young males. He stated that their research is dividing the problem up into 3 areas: perception, cognition and execution. Research is progressing along the lines of divided attention, focused attention and processing speed.

One of the most promising areas of study had been with the useful field of view. Reaction times in the field of view are analyzed and found to range from 40-240 milliseconds. This is tested with a full view of a driving scene, on which is overlaid a series of targets. While the person fixates a central target, one of the peripheral targets will change to a different type of figure. The subject needs to identify when they notice the altered figure as quickly as possible, while still fixating the central figure. A plot of the size and speed of response is called the useful field of view. Some modifications that are being worked on by their research team are to add moving and changing backgrounds rather than the static scene used in most useful field of view studies. One question they are looking into is: How to disengage vision to look somewhere else? They have noticed troubles in dynamic situations. From what I saw this type of testing could easily be done on an IBM PC. My understanding is that the pioneer in this field is preparing an instrument for sale which would be rather expensive.

Other things that they are working on include visual tracking tests and behavioral questionnaires relating to driving performance. Also, changing the useful field of view tests to become attentional field of view tests. While having to watch a central target which has a dot in a circle which may move out of the circle, the job of the subject is to press a button when the dot crosses the edge of the circle. At the same time, peripheral objects are changing shapes, which must be indicated by hitting another button. Next he reported on a study involving collision avoidance response time. 1000 milliseconds is divided with the first 200 milliseconds to allow for the sensation of the situation of the stimuli to be received into the central nervous system. The next 600 milliseconds is needed for cognition. Taken together, the 800 milliseconds is the reaction time. The next 200 milliseconds are used for the movement to occur. The question that they are trying to investigate is which parts slow down with aging?

A UK optometrist next reported on a pilot test of a test of contrast susceptibility. The idea here is to see if there is a greater than normal loss of the ability to detect and read small letters when the letters are presented with reduced contrast sensitivity. Thus, the reading is an amount that the end point VA reduces relative to a change in contrast. The bigger the loss of VA, then possibly the more difficulty that the person will have with driving? Most people show a loss of about 3-4 lines of VA, while some show much larger decreases. It has been shown that high contrast VA is no predictor of accidents. Low contrast sensitivity VA was better at predicting accidents, but the best test was the relative decreases shown from one condition to another.

Next was a presentation by an Englishmen who was doing research on wind shields (wind screens - UK term). He stated that older people need three times more light and that the way to do this is to get cars with slopes of the windshield less than 50 degrees and to get wind shields with no tint.

A person from South Dakota (psychologist researcher) has done lots of work in vision, the aging and driving. He may be a very good contact. He is Prof Frank Schieber, Human Factors Laboratory, Department of Psychology, University of South Dakota, Vermillion, SD 57069. He first reported on a NHTSA report on crashes per million car miles driven. The rate for 80 year olds is just under that of the 20 year olds and the rate for 85 year olds is significantly higher than 20 year olds. Older drivers tend to still be good risks for insurance companies since they limit their driving, so the number of accidents per person is still relatively small in the older population. It is when you look at accidents per miles driven that the problem begins to surface. Older drivers tend not to get involved in high speed accidents. They tend to get into accidents involving right of ways and missed signs. Mr. Schieber echoed the statements of others as he stated that it is difficult to relate vision data to driving performance problems with testing done at the level of the end organs (read visual acuity types of testing and not testing of the visual process as we understand it). He stated that in order to see the problems emerge we need to stress the driver being tested and we need to challenge their skills beyond a normal driving situation. Thus, he wondered how to design a safe but challenging and stressful driving situation or course to see the problems emerge. A classic testing paradigm was used which is called secondary task problem solving during driving. The driver would be given a mental arithmetic problem to work continually during the testing. Testing was first done in a simulator to be certain that there was little risk of actually causing an accident. The person had to listen to 2 digits and then to subtract the second digit from the first and say the answer as quickly as possible. He used a crude 60 degree simulator with a rear projection system. The speed of the car was controlled by the computer. All the person had to do was to steer the car. Two different courses were used, a smooth gentle curve course and a more difficult high load course with varying curves. They measured the latency between the time of the presentation of the second digit to the calling out of the answer on the mental arithmetic. They also monitored the accuracy of the driver in terms of staying in the lane. The only differences noted were in the latency of calling out the arithmetic answer. There was no measurable difference in the accuracy of the driving. This has allowed him to get approval for real road tests with real cars of this evaluation system. There was also no change in the accuracy of the math problems. On the low load driving condition all groups, young and old drivers had a latency of 62 milliseconds. On the high load driving task the young group did not slow down. However, the older drivers slowed to 140 milliseconds on average, with one third of the group getting very slow, pulling the other two-thirds down. It is possible that this very slow one-third group is the group we should zero in on to do VT with to see if this ability improves. I have contacted Mr. Schieber about doing just such an experiment. The equipment for performing the test is very simple. A dual cassette tape machine is used. The play cassette has the math problems on it and the record cassette is set to record the math sets and the voice of the subject.

Workshop Continues - "Visual Standards in Driving", Chaired by Peter Smith an optometrist from the UK Lot's of talk but, although starting into this nearly 8 years ago, they have only been able to rule out that which might give a simple answer. They now realize that simple measures of sight and parameters of sight will not give any idea of who will or will not have an accident! Surprise, surprise! Although they have tested lots of things, they are no closer to an answer of what should be tested than when they started. A discussion occurred revolving around whether evaluating driver competency was better than looking at accident rates. To do this there needs to be some quantifiable way to measure driving competency and to rate it. This leads to discussion of whether actual driving needs to be done or if driving in a simulator will suffice. I was very active in the dialogue and felt that I altered the direction of the interactions. It went well and helped me see that the field is WIDE open here. I was hoping that it was more well defined and that we would have something to evaluate the effectivity of VT for seniors! Some promising things relate to work on the usable field of view. I have some references for work done on this and much of it looks like it could be done on a PC relatively inexpensively. A device is being set up which will be rather expensive. Attention appears to be a key factor. I discussed a quote from Bruce Wolff, "Most visual problems are problems of omission." and we began to talk about attention monitoring systems to help keep drivers aware. I mentioned alpha rhythms and another researcher mentioned that Nissan has orked with a blink monitoring system which can detect a change in rhythm which may lead to sleep. It was reported that a study of police officers on patrol showed that they can only maintain high levels of visual awareness for 45 minutes or so. They do so by actively noting specific details in the environment out loud in an almost running dialogue. The talk moved to the fact that "normal" people may not even be able to maintain that long!

****

Kamlesh Chauhan, "The Mandelbaum effect and night driving", Department of Optometry and Vision Sciences, UMIST, Manchester, UK.

He reported on a series of experiments with the Mandelbaum effect and looking for changes in accommodation to the plane of the windshield. Several sample windshields were mocked up with nail polish to simulate different degrees of structured field and interposed at different distances away from the person, while their accommodative levels were monitored sing a Cannon R-1 Infrared optometer. The bottom line here was that they found almost no evidence of the Mandelbaum effect in the situations they examined. I asked if the windshields were tilted as they usually are in most cars and they stated that they were. I mentioned that I felt that the only time that the effect would happen would be if the windshield were more flat and if it were interposed more nearly perpendicular to the line of sight of the driver. Since most car windshields now have a more aerodynamic shape and are tilted relative to the line of sight, the threat of the Mandelbaum effect pulling patient's accommodative levels in toward the car windshield involuntarily are much less than either feared or expected by some.

Conclusion

I found this meeting very informative. Many new contacts were made with researchers in a niche field that is related to what we do in behavioral optometry. I hope, through maintenance of these contacts, as well as the further development of some of these contacts, to move forward in the development of a driver's testing and training program for senior citizens.

Phone:1-800-447-0370 Fax:1-410-252-1719

E-Mail Address: Paul.HarrisOD@GMAIL.COM