VERKEER-ZIEN
IWACC
MUNUS VEHENTIBUS OMNIA VIDERE

# EXTRA

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For **questions or comments** please contact Mieke Groot <mieke@iwacc.com>.

(Max van Kelegom has abandoned Verkeer-Zien on March 2nd 2018.)

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(Max van Kelegom heeft Verkeer-Zien op 2 maart 2018 in de steek gelaten.)

# Drawbacks of the emphasis on conspicuousness for the natural coherence of the perceived traffic scene

## Introduction from a 2014 viewpoint

The article presented on the following pages dates from 1982. It is one of the first publications describing the concept of a 'model scene', or as we now say *model tableau* (*modeltafereel* in Dutch), to designate our visual experience of an environment. Inevitably, in places the text is out of date. Some of it has been superseded by the advance of understanding. Other aspects have been overtaken or made irrelevant by the change of the technical or social context.

However, two things stand out as being as relevant as ever: the usefulness of the term 'model tableau' to give a handle to our actual visual consciousness or experience, and the necessity to approach visual interventions in the traffic environment from an understanding of coherent scene-recognition.

In the context of that time it was customary to try for improving road safety by the addition of simple conspicuous signalling devices, especially for night-time conditions. For instance, in the Netherlands, the Foundation for Traffic Safety Research SWOV had just introduced a single red retroreflector of high brightness to be attached to the rear of bicycles, which was made compulsory by law. This provision was mainly meant to provide sufficient conspicuousness.

Meanwhile, IWACC had been working on a different approach, based on the model tableau and emphasizing recognizability in the context of a coherent scene. These subjects are extensively discussed in the 1982 article. Some comments from our 2014 view are added in an appendix at the end of the article.

(A sideline of our work at the time was bicycle lighting. Everything said in the article about the technical side of that subject is completely obsolete, as the technology of batteries, dynamos and LED-lighting as per 2014 has created a totally different landscape. Another idea that was a topic of that time was a city beam for cars; this subject has gradually sank into oblivion.)

The article itself, as it's shown here, is the careful and accurate rendition in modern type etc. of the original typewritten manuscript sent to the organizers of the "14th International Study Week Traffic Engineering and Safety".

Added at the end of it is an appendix with page by page notes about details touched upon in this 2014 introduction and in the 1982 article itself. This appendix is followed by a table of contents.

Ruurd Groot, October 2014

14th International Study Week

Traffic Engineering and Safety

# Title: Drawbacks of the emphasis on conspicuousness for the natural coherence of the perceived traffic scene.

Subtitle: The problems and possibilities of an approach in terms of coherent scene vision and recognition, discussed on the basis of night-time traffic, the perceptibility of two-wheelers, retroreflective provisions, fundamental considerations, etc.

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## 1. Deleterious effects and limitations of conspicuousness

### 1.a. General Introduction

Vision is the most important information channel for the immediate control of traffic behaviour. For traffic elements visibility is a desirable quality, but as yet there is no consensus how visibility should be defined or measured. The analysis of visibility in dimensions gives rise to conflicting theories.

In simple experiments with human subjects, certain aspects of the visibility of objects may be determined, e.g. how quickly they can be "detected" by subjects under the same circumstances. Computation of the mean time interval needed, assigns a score-number to each object; ordered according to these values the objects are arranged in sequence of their *conspicuousness*.

Provisions for enhancing visibility can be divided into lighting provisions meant to make other objects visible, and visual provisions attached to the objects themselves. At present the attribute most strived after for the latter visual provisions, is their conspicuousness. This attribute is considered to be the most effective and the most easily handled.

### 1.b. Suppression-of-surround

The strength of a signal is an important means for conspicuousness: the intensity of a light source, the saturation of a colour, high contrast with the immediate surroundings in general. Above a certain observed angular size, larger size often also means more conspicuousness; available space, cost and other aspects, however, often limit the possibility of enhancing conspicuousness by enlarging size. Traditionally, light intensity, high contrast etc. are our main source of conspicuousness.

In darkness, the luminance of an intense light source has a veiling effect. This glare may continue to have effect for a more prolonged period, because the gain factor ("sensitivity") of our visual system is quickly lowered under conditions of higher illumination; restoring the gain takes considerably more time.

Intense lights or high contrasts in general often have another more subtle deleterious effect: such elements tend to suppress information from the immediate surroundings, without the subject being aware of any physiological glare. Our findings indicate that this suppression-of-surround effect is particularly harmful in the near periphery, i.e. the area surrounding the centre of high-resolution vision.

### 1.c. Arms race in lighting

Linked with the glare-effects mentioned in the preceding paragraph, is the competitive nature of conspicuousness. Within a certain scene an experimental object may have the highest conspicuousness; if then we introduce an even more conspicuous object into this scene, we generally find that the original object now needs more time to be detected. This means that more conspicuous objects lessen the conspicuousness of other objects – not only relatively, but absolutely.

In traditional policy, safety is the reason for trying to achieve the highest possible conspicuousness for every relevant traffic element. If by this policy the conspicuousness of one element is enhanced, the conspicuousness of other eleents may decrease according to the competitive principle. This in turn may necessitate the enhancement of the conspicuousness of some of the other elements; and so on...
Particularly for night-time traffic, this process may lead to, and in some instances has indeed led to, a virtual arms race in signalling devices and lighting equipment for road vehicles.

### 1.d. Light-point configurations

The emphasis on conspicuousness has promoted the use of intense light-points or luminous points (signal lights and reflex reflectors) on road vehicles. Apart from conspicuousness, sufficient identifying information has to be conveyed, so it is attempted to array these points into coded abstract patterns. A few of these patterns have a natural similarity to the object identified, but most have not. Moreover, with a limited number of points only a limited number of easily distinguishable visual patterns can be constructed.

Though patterns of a few singular points are discontinuous, our visual system tends to organize them into forms. Three points are often perceived as a triangular pattern. Such perceived forms, however, have a very simple structure and contain only very

little information. This low "redundancy" makes them very vulnerable: if one point of a triangular point-pattern is deleted, all that remains is a rod-like impression with two luminous end-points.

Some experts therefore propose to further enlarge the number of intense light-points on road vehicles. By this device and by the use of different colours they aim to multiply the number of distinguishable configurations. To overcome the problem of low redundancy and to attain easy recognition, however, very large numbers of intense light-points in different colours seem to be indispensible.

### 1.e. Bicycles and pedestrians

From the first, bicycles and pedestrians have been handicapped in the race for nighttime conspicuousness. For the time being, any serious attempt to increase the output of the bicycle generator (dynamo) will seriously increase the requisite pedalling effort and adequate batteries (piles) are expensive. Bicycle lighting equipment therefore must remain rudimentary; recently developed halogen-units for bicycle headlights will not essentially remedy this shortcoming. Available space and relative cost will limit the utilisation of the large number of small-sized reflex reflectors required for adequate identification.

For pedestrians, the situation is even worse. The space available for signalling devices is determined by their clothing. The available clothing in turn will be determined by diverse factors as weather, fashion, age-group etc. It is unlikely that pedestrians will ever be willing to equip their clothing with a sufficient number of intense light-points (with the requisite power-source) or solid reflex reflectors of the traditional corner-cube or prismatic type.

### 1.f. The necessity of conspicuousness

In view of these problens it would be nice if we could do without conspicuousness altogether. This is not so, even if adequate public lighting could be provided everywhere. Being sufficiently conspicuous means, that something can be visually detected in an adequately short time, which surely will remain necessary. On the other hand, this does not mean that we should stagger on blindly in a race for competitive conspicuousness, which might result in a chaos of intense light-points.

The problem seems to be threefold. First there is the case of bicycles and pedestrians, who cannot sufficiently compete if traditional methods are continued. Secondly traditional means for conspicuousness seem to be little suited for conveying much identifying information. In the third place it is difficult to determine when something is "sufficiently" conspicuous.

For political convenience one may define a threshold of minimum conspicuousness (e.g. a maximum detection time) for a given standard of experimental conditions. There is, however, no consistent way by which the order of conspicuousness thus measured out to traffic participants, can be translated to the actual relative conspicuousness in real scenes that differ from the standard conditions.

## 2. Recognition in a coherent traffic scene

### 2.a. Form and similarity

Many experts assert that even with day-time traffic, visual conditions are far from optimal for efficiency, comfort and safety. Still it is a fact that generally speaking, day-time traffic is relatively more efficient, more comfortable and safer. The visual nature of the day-time traffic scene differs greatly from night conditions – and not just in the level of illumination. The day-time scene is infinitely more complex and contains vast amounts of visual information. Much of this information, moreover, is considered by many experts to be irrelevant (e.g. information from the surrounding landscape) and therefore might be expected to hinder the intake of the "relevant" part. Nevertheless, our visual system appears to be surprisingly efficient in perceiving the day-time traffic scene.

In contrast with night conditions, the day-time scene is continuously "filled". Overlapping elements of larger size facilitate the easy distinguishing of recognizable forms. Contrasts are relatively low (lower than with intense lights on a dark background), and conspicuousness may be correlated with size and/or recognizability. The continuity, the larger sizes, the relatively low contrast and the ensuing recognizability are important positive aspects of the day-time scene. Accordingly it may be advantageous to consider the relevance of these aspects for night-time provisions, possibly on the basis of larger forms with lower luminance, and shapes as naturally similar as possible to the objects they identify.

### 2.b. Scene-dependence

The coherent day-time scene is so easily perceived, that people take much about the visual process for granted. It seems to be a matter of course that we recognize familiar things, and we tend to accept the surrounding scene as a simple three-dimensionally distributed collection of more of those things. For the naïve conception, what we see is the optical image of things, made available to the mind through the eye.

Actually, even from the relatively little we understand about it, the visual process is known to be forbiddingly complex, certainly far too complex to be adequately discussed within the scope of this short account. All the same, a certain aspect of visual perception has to be indicated for our argument. Many people are familiar with the phenomenon that something may look "greenish" in one type of surroundings, but "reddish" in another. Also a certain element may be easily recognized in one combination of features, but may appear quite alien (or even be invisible) in another. Certain isolated instances of similar effects are popularly known as "optical illusions".

The visual quality of an element can be influenced by the rest of the scene. Now any part of the scene can be considered to be such an "element", so it is better to say that the elements of a scene are interdependent in their visual quality. This aspect of visual perception we have chosen to label "scene-dependence".

Scene-dependence occurs with detection (by conspicuousness) and recognition, but in different ways. Detection displays it in the competition between conspicuous signals. Recognizable elements tend to "label" each other and so can make one another clear

to the observer. Scene-dependent effects fundamentally distinguish the "scene-as-seen" from the physical environment.

### 2.c. The model-scene

In discussing visual matters we clearly need to distinguish between the physical nature of things ("what they are") and their visual nature ("what we see" or "how they look"). The objective existence of that physical world is mostly taken for granted, but how do we determine the "ontological status" of the scene we see?

We mentioned the naive, but seemingly straightforward view, that we see by images made available to the mind. This view suggests that the mind has an eye of its own to see these secondary images by. But surely then the mind's eye must make its own tertiary images available somewhere else again, and so on... This obviously leads us nowhere.

Some visual theorists have chosen to ignore the ramifications of this cognitive problem altogether. They discuss vision as a sequential optical-neurological process producing behaviour, treating it either in a strictly black-box manner or describing certain information-processing stages between optical input and behavioural output. Others, notably Ulric Neisser, criticized this negligence of mental experience as a gross underestimation of the cognitive aspects of perception. Rather one should postulate a continuous perceptual cycle of model-building, an active search-process in which dynamical cognitive functions play a role quite as important as the sensory stimuli from "outside".

In this vein we are tentatively developing a practical model for part of such a cycle, on the basis of our experience with artificially manipulating and constructing coherent scenes. In this model we designate the scene-as-seen with the label "model-scene". The model-scene is an entity distinct from the physical environment, but it is not merely an image, nor any kind of object to *be* visually experienced. Rather it is the active visual experience itself, a dynamical state of cognitive mapping.

The unique visual quality of the model-scene indeed derives from the kind of sensory input it relates to, witness the fact that closing our eyes quickly makes decay any stable and coherent model-scene we had. But closing our eyes will not entirely end all visual experience, vague "imaginary" model-scenes testifying that even then visual model-building goes on, the visual quality being unstable as the cognitive loop has been disconnected from the sensory loop.

### 2.d. Foundations of ignorance and knowledge

The relevance of theoretical models as indicated above (2.c.) may not be immediately clear. Most visual research for traffic applications is not even based on any explicit model whatsoever. Much of that research perforce has to be limited to tests, comparing the effects of given provisions in certain conditions. Sometimes small changes to the provisions are proposed on the basis of the tests, but new approaches based on visual insight are seldom suggested. The provisions tested mainly stem from what is traditionally available, e.g. as instruments for conspicuousness, or they may be "new" permutations of these. Other sources of provisions are the (sometimes more or less haphazard) products of commercial invention and design.

This practice may be pragmatic, but it is no sound basis for progress. Neither, however,

might be abstract cognitive theories. Also aspects like scene-dependence prevent us from remedying this state of affairs by adopting isolated effects and principles, dug up in pure visual researches, as a basis for traffic provisions.

What we would need is a research policy directed by a practical model of scene-vision, capable of indicating in what direction new fertile approaches might be found.

### 2.e. Recognition and uniformity

Such a model has to be tailored for the intended application to an infinite variety of possible (traffic) scenes. Now any single visual element tends to function differently in every different scene, due to the principle of scene-dependence, although it is possible to design quite stable (consistently identifiable) visual elements. For night-time provisions, traditional policy in fact emphasizes the need for strict and stable uniformity, also because of the low redundancy of the light-points code.

Our own model, however, predicts that strictly uniform configurations from a code of low redundancy are not favourable for easy perception of coherent dynamical scenes. On the contrary, it indicates that easy perception has a need for high redundancy, and for elements which are at least partially non-uniform. The sampling-over-time character of vision necessitates some non-uniformity in moving elements, if continuous and predictable change should be experienced. A soccer match between teams, each consisting of eleven visually identical players, would be quite impossible to follow in detail.

Perhaps the light-points method alone has too little affinity to scene-perception. Interpreting a code of abstract point-configurations is related to reading, which does not normally involve the organization of a model-scene. Enhancing conspicuousness may further hinder the formation of a coherent model-scene, because high-contrast elements suppress the information in between, detracting from spatial coherence.

### 2.f. Practical sources

Any model has to be compatible with findings from researches, and with plausible theoretical constraints. The history of science and technology further suggests that, apart from these sources, any viable model or theory should have some roots in the tricks, skills and insights of a practical experience or craft. People well grounded in electronics will have at least some idea of how to build a radio. Most visual investigators, however, seem to have no idea at all how to construct a scene, e.g. by painting. Consequently, they resemble illiterate typographers.

In our investigatory approach, we incorporate the painting, drawing or otherwise producing of artificial scenes. This may seem like an extreme departure from accepted scientific method, but in a sense the visual scene of the traffic environment itself is just such an artificial scene.

Many insights and facts on which our model is based, derive from our "artistic" investigations. The artificial production of coherent scenes is a craft of very ancient tradition. We have experienced it as a serious source of insight and practical techniques. (We must also warn that this source can be polluted by romantic mythology and anti-rational attitudes.)

## 3. Available systems and possibilities

### 3.a. Actual practice

In actual practice, people developing visual provisions for night-time traffic do have relevant insights and skills of their own. Vehicle designers have produced effective rear lights with lower luminance and larger area. Public lighting engineers have introduced systems that promote a coherent model-scene by enphasizing "visual guidance". Road markings and delineations are instances of long standing. Another example is found in reflective tyres for two-wheelers, which facilitate automatic recognition.

All these examples seem to clash with the traditional view, that general visibility can be derived from conspicuous points, aided by photometrically defined light-distribution on the pavement. In fact the examples do not fit in the photometric universe-of-discourse. The effective public lighting system mentioned (a line of fixtures, longitudinally arranged over the road axis) does not comply with present photometric standards. Lots of light are "lost" on both sides of the road. According to our model, some indirect illumination of "irrelevant" surroundings might be quite benificial.

### 3.b. Possible extensions

It seems possible to extrapolate from such examples (3.a) to more provisions promoting an effective and coherent model-scene. Probably then more of an effort has to be made to search for practical models of scene-vision, in interaction with related researches.

An obvious candidate is the "city-beam", a proposed special head-light for motor vehicles, to be used in areas adequately illuminated by public lighting. Characteristics to look for in the city-beam could be: low glare, adequate conspicuousness, good recognizability, but also sufficient output for the perception of retro-reflective materials. These properties in turn suggest a large luminous area with a relatively low luminance.

Whatever course is taken, we would like to stress the desirability of discontinuing the race for more conspicuousness, the main political reason being that pedestrians and bicycles are not, and will not be able to compete.

### 3.c. Retroreflective materials

Retroreflective materials (fabrics, adhesive sheetings and special coatings) are commonly used for road signs and markings, vehicle registration plates etc. These materials are admirably suited for conveying complex visual information by way of larger forms with a relatively low luminance.

Retroreflection implies that most of the light is reflected backwards in a narrow cone towards the source. For a given geometrical disposition in space of observer, light source and retroreflective surface, and for a given light source quality, there is a limit to the possible luminance. Enhancing it entails narrowing the cone of reflection, which is restricted by the condition that this cone should contain the eyes of the observer.

Within these practical limits, there is a wide variety of brightness and colour available in these materials. With sheeting materials subtle nuances and detailed textures can be

achieved by appopriate silk-screen printing in transparent and opaque inks. Retroreflective materials are not cheap, but this is compensated by the fact that no other energy source is needed than the lighting equipment of the observer's vehicle.

### 3.d. Retroreflective recogition

Retroreflective materials apparently are fit for recognition-oriented provisions promoting a coherent model-scene. The increase in luminance presented to an approaching observer, is similar in principle to that presented by normal surface materials lighted by the head-lights, an effect that distinguishes retroreflective materials from approaching light *sources*. Even in areas illuminated by more or less adequate public lighting, retroreflective materials can greatly enhance the visibility of important elements of the scene.

We already mentioned retroreflective tyres for bicycles (3.a). Clothing for pedestrians is sometimes provided with small strips of retroreflective fabric. Such strips, often applied to the jacket only, do not greatly enhance visibility. Recognition can be promoted by longer and broader strips following body contours, but more effectively by newly-developed coating. Coating covers the entire article with an unobtrusive retroreflective substance, without apparently otherwise changing fabric quality. These and similar functions of retroreflection made us suggest (3.b) a sufficient luminous output for the proposed city-beam.

At present we are investigating the possibilities of applying retroreflective materials to road vehicles, in order to approximate their day-time appearance. The investigation is conducted in co-operation with the government, the Royal Dutch Touring Club ANWB, and the industry. Included are "logo's" and other familiar design-elements on public transport and commercial vehicles.

### 3.e. The inevitable compromise

Adequate public lighting, optimal vehicle lighting equipment, the intelligent use of retroreflective materials and similar devices might possibly suffice to occasion a coherent model-scene and acceptable safety for all. Even if this were so, we would not be able to make it happen today. It is far from clear what kind of public lighting is adequate, and if it were clear, the cost of providing it everywhere would be prohibitive. The same more or less goes for vehicle lighting equipment.

Also as yet there is no evidence whether a coherent model-scene can be achieved for all of night-time traffic, and least of all whether such a model-scene would do away with the need for conspicuous points and their harmful side-effects. For the present we can only qualitatively advocate the benefits of a coherent model-scene, while hoping for an acceptable balance of conspicuousness and scene-dependent recognition. Something of the sort surely can be achieved by present means, as represented by contemporary lighting engineering, retroreflective devices etc., supplemented with more scene-oriented research and development.

## 4. Immediate problems for research and policy

### 4.a. Obstacles

Many obstacles hamper the acceptance of more emphasis on recognition and coherent scene vision for future visual traffic provisions. Of these obstacles the inertia of tradition and vested interests are the most pervasive. Difficulties, that adhere to all changes in policy, will also present themselves. Initially, incidental applications of new principles may not enhance, or may even slightly reduce traffic safety in certain instances.

Initial reduction of traffic safety might be caused by an individual decrease of conspicuousness, while everything else remains as before. Causes of initial trouble might be the time needed for behaviour to adjust itself, for knowledge and know-how to be better implemented, and for the new approach to be extended in a co-ordinated manner to traffic as a whole.

Only very simple situations have conditions that can be ordered in a one-dimensional sequence of quality. Such situations are amenable to continuous improvement. In complex, multi-dimensional situations, a "better" position often can only be reached through stages that do not seem to be better than the initial position. Long-term policy for complex situations often conflicts with short-term priorities.

### 4.b. Experimental problems

At present our "theory" is just a preliminary framework of tentative elements. The knowledge needed for realizing the proposed approach, has ultimately to be based on reliable experiment. Investigating recognition and scene vision, however, appears to be much less simple than the comparative testing of conspicuousness. The requisite relevance of research findings to a protean traffic environment, further complicates matters.

Much of contemporary researches and theory on recognition and scene vision is already distrusted by those, who are offended by the metaphysical flavour sometimes pervading cognitive psychology. To them we will appear to go from bad to worse, in proposing visual arts and crafts as sources.

Of course, those cannot be our only sources. They must be supplementary to more accepted lines, as instanced by researches into peripheral recognition, "field dependence", and maybe even "blind sight". As always it is very difficult to design experiments, simple enough for analysis, but of sufficient complexity to be meaningful for scene vision in an actual traffic environment.

### 4.c. Conclusion

Naïve faith in our approach would be at least as bad as continuing to rely on conspicuousness as a panacea. Yet, the drawbacks of conspicuousness are quite real. Particularly the fact that bicycles and pedestrians cannot compete in the struggle, is of crucial importance. In view of this certainly more has to be known *and done* about coherent scene vision.

Our own investigations into coherent scene vision, based on the artificial construction of scenes, and our attempt to develop a theory of the model-scene, are to be understood in that vein. We even plead the speedy introduction of scene vision oriented traffic

provisions, however scanty present knowledge may seem.

It is justified to demand the incorporation of more scene vision oriented researches in investigatory policy. It can also be argued, that speedy but intelligent introduction of scene vision oriented provisions would not be premature on account of theoretical ignorance. Practical use necessarily precedes usable theory, as e.g. steam engines preceded thermodynamics by almost two centuries.

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## Bibliographical notes

- As yet IWACC has not published any specific research material. Some details are contained in reports, communicated by us to the Royal Dutch Touring Club ANWB. For this organization we also composed a loose-leaf file of background elements:
  – (IWACC/ANWB); Visibility and Safety of Two-wheeled Vehicles; Den Haag; 1980.

- There is an enormous amount of technical literature on public lighting, vehicle lighting equipment, road markings, signs etc. As to the longitudinally arranged public lighting and the proposed city beam, however, there are no very recent publications of importance.
  According to the Dutch expert Dr. D.A. Schreuder, of the Foundation for Traffic Safety Research SWOV, this seeming stagnation can be chiefly ascribed to political resistance. The original reports on these subjects, however, are quite persuasive.

- There is also a great amount of technical literature on general visual researches. For those seeking a quick overview, we recommend:
  – John P. Frisby; Seeing (Illusion, Brain and Mind); Oxford 1979.

An introduction to the cognitive basis of perception can be found in:

  – Ulric Neisser; Cognition and Reality (Principles and Implications of Cognitive Psychology); San Francisco 1976.

# Appendix

## page 1 (**Introduction from a 2014 viewpoint**)

ad 'model scene'

The Dutch term at the time was 'model tafereel', as it is now. Initially we used 'model scene' as the English equivalent, but at the suggestion of Jan Koenderink we decided to change it, choosing 'model tableau' as better suited to convey the intention.

As a short explanation I now prefer this phrase: "By the term model tableau we mean the coherent visual experience of an environment, considered as a separate entity, i.e. apart fom sounds etc."

A simple experiment to make it clear to an audience, also used by Jan Koenderink, is: 'Please close your eyes and wait a moment. Now please open them again. What happened now is a miracle: suddenly you see the world around you. And — as yet, science has nothing to say about it!'

ad 'a different approach, emphasizing recognizability in the context of a coherent scene'

From this approach we had developed an alternative for improving bicycle visibility at night. This included a unit for the rear, with a more redundant shape that was evolved from the traditional and familiar Dutch bicycle rear equipment: an improved, dynamo driven rear light, combined with a red retroreflector, at the top of a vertical strip of yellow retroreflective material. This part of the proposal was superseded by the red retroreflector mentioned before, so we abandoned that part of our project.

However, we had also adopted the idea of retroreflective strips, integrated in the sidewalls of bicycle tires. At the time, this product, an original invention of the 3M company, was in a very mature state of development. We kept on developing this part of our project, which resulted in its final adoption as obligatory bicycle equipment in our country after extensive research by IWACC.

ad <the "14th Inter-national Study Week Traffic Engineering and Safety">

This occurred in Strasbourg, from 7–10 September 1982. President of this conference was prof. ir. E. Asmussen, the then director of the Foundation for Traffic Safety Research SWOV (until 20th November 1986). Our contribution, presented on the invitation of the Royal Dutch Touring Club ANWB, was accepted without changes.

## page 2 (title page)

ad IWACC – KLEURTOESTAND- EN TAFEREELONDERZOEK etc.

More on the history of IWACC at the end of this appendix.

page 3

ad <**1.b. Suppression-of-surround**>

Nowadays we know that this is the more worrisome as it has been proved that the periphery is indispensible for recognizing the 'gist' of a scene. It is clear that interfering with this special peripheral competence may destroy scene coherence.

ad <**1.d. Light-point configurations**>

The past years have seen the resurrection of the spectre of configurations of bright light-points, caused by the introduction of Led lighting. When using surfaces densely packed with small Leds of moderate brightness the beneficial effect of a smooth surface is imitated. However, using sparsely distributed very strong Led light is quite detrimental to easy recognition.

page 4

ad <**1.e. Bicycles and pedestrians**>

As explained in **Introduction from a 2014 viewpoint** on the front page, this section is now totally obsolete.

ad <**1.f. The necessity of conspicuousness**>

In hindsight, field testing of a proposed provision in a wide enough selection of real traffic conditions seems to be the most practical solution for judging whether it has the required discernability, while not masking the discernability of other useful aspects or elements of the traffic scene.

page 5

ad <**2.a. Form and similarity**>

This part reflects a rather primitive stage of our current views, but its final conclusion is still quite to the point.

ad <**2.b. Scene-dependence**>

As commented for 2.a, our current views on this subject have evolved. The aspect of scene-dependence seems even more important than we suspected in 1982. The notion of a *scene gist* has given it a wider meaning, and the role of peripheral vision is documented in a clearer way.

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ad <**2.c. The model-scene**>

The concept of the model-tableau – as we call it now – has become central to our present way of thinking, cf. our comment ad 'model scene' for page 1 above. A modern discussion is available on the Verkeer-Zien website, but see the next paragraph.

Our Verkeer-Zien website offers some recent articles about the model tableau, but most of them in Dutch. We'll try to remedy this asap. For the time being you might have fun with Look Who's Driving.

ad <**2.d. Foundations of ignorance and knowledge**>

Present practice for interventions in the traffic environment has evolved quite a bit. Especially an approach from the principle of categorizing road types has become dominant. This has led to a formal system of measures pertaining to the road itself, emphasizing its dimensions and markings. On our Verkeer-Zien website we offer our objections to this approach, regrettably most of it only in Dutch. Still, it is clear that an important drawback to this way of thinking is the almost total neglect for visual aspects like scene-coherence, scene gist and peripheral vision.

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ad <**2.e. Recognition and uniformity**>

What's written here certainly applies to the present approach, with its emphasis on uniform rules and regulations for formally identified categories.

ad <**2.f. Practical sources**>

As a 'practical source' we would now add the involvement of people actually creating a traffic scene. Of course, first they should have to abandon the habit of mainly judging the situation from floorplan-like maps. Then they would have to train themselves and be trained to judge resulting traffic scenes from the true viewpoint of drivers, bicyclist etc. And certainly, they would have to know more about what works and what doesn't work when creating an environment intended to summon an effective model tableau.

This isn't as utopian an idea as it seems. Even now we've noticed that people doing the real work with tools from spades to bulldozers etc. often have their own pertinent critical opinion about the way the formal planners try to guide the traffic process from behind the desk. And when asked why they don't pass their findings to the higher-ups, they'll always give the resigned answer: "Those people? They'll never listen to us."

page 8

ad <**3.a. Actual practice**>

The photometric standards mentioned here tended to define a minimum illumination to reach a minimum average luminance, which indeed turned out to be exaggerated. Large surfaces – or rather large recognizable forms – don't need all that much luminance, provided other items or areas in the scene don't interfere and most of the scene contributes to a healthy scene-coherence.

ad <**3.b. Possible extensions**>

As noted in the 2014 introduction, the one-time topic of the city beam is largely forgotten. On the other hand, nobody nowadays would consciously adhere to the idea of continuing "the race for more conspicuousness". And from our present views, we would change "the main political reason" in the last sentence into "the main social and ethical reason" – which does not come down to the same thing at all.

ad <**3.c. Retroreflective materials**>

Although there has been some significant progress in the development of rereroreflective materials, most of that has gone into materials for all kinds of different applications and into brighter and more 'concentrated' sheeting types. For large surfaces these last improvements are not the most needed. And for vehicles with driver positions there is more need for special materials that allow for a larger *observation angle*; by more 'concentrated' we meant retroreflection in a narrower beam, which demands for a smaller observation angle. Modern bicycles have better and more reliable head lights, but regrettably these tend to be placed lower than before, which implies a larger observation angle…

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ad <**3.d. Retroreflective recogition**>

At the time we had a fully retroreflective prototype jogging suite at our disposal, which was extremely effective and had a normal look and feel in daylight. Marketing it appeared to be hampered by the fact that sale negotiations etc. had to be conducted in daylight conditions, so nothing much ever came of it. This wasn't the only candle that was blown out after a promising start.

The project mentioned in the last paragraph (investigating the possibilities of applying retroreflective materials to road vehicles) started around 1981 at the request of the *Directie Verkeersveiligheid* DVV (Directorate of Traffic Safety). Our first report "Non-Signal Retroreflective vehicle markings and traffic safety" appeared in July 1982. A later more general report *Retroreflekterende materialen en de visuele inrichting van het wegverkeer* (Retroreflective materials and the visual arrangement of road traffic) was jointly published in March 1986 by DVV, Traffic Department ANWB and the *Studiecentrum Verkeerstechniek* (Centre for Studies in Traffic Technology).

In the course of this assignment we were given the task of regulating the application of commercial retroflective marking on vans, lorries etc. This involved defining a certification standard, actual testing of designs and issuing permits. After many months of performing these duties it suddenly became clear that the commissioning authority had neglected to allocate any budget for our efforts. As a consequence we were forced to inform all those involved that we had to give up. This may have been one of the causes for the conflicts alluded to at the end of this appendix in a special section about IWACC.

ad <**3.e. The inevitable compromise**>

Apart from more research, we now would suggest more attention to the possibility – or rather advisability – of using 'live' visual judging by people with the necessary skill and knowledge.

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ad <**4.a. Obstacles**>

After all this time, both from old and very recent experience, we can't but add a list with a different sort of very stubborn obstacles. Among those are the total reluctance of researchers, policy makers and politicians to think 'out of the box'. And although we met with quite a lot of interest and even approval in the eighties, the present atmosphere of 'networking for power' seems to elicit open resistance from 'vested' interests. While individuals often enough embrace our stance in direct contact, back at their positions they prefer to fall back in the safe shackles of their hierarchy. More on that subject at the end of this appendix in a special section about IWACC.

ad <**4.b. Experimental problems** & **4.c. Conclusion**>

Special circumstances prevented us for many years to fully develop and underpin our approach in a public manner. Still, in the recent past some material has become available on the Verkeer-Zien website, albeit mainly in Dutch. Some details about developments have been given in the comments above. We especially might draw your attention to the comments ad <**1.b. Suppression-of-surround**>, ad <**1.f. The necessity of conspicuousness**> and ad <**2.f. Practical sources**>.

An important addition is our view that roads and traffic have to be considered in the wider context of the surrounding landscape, and with more attention to all of its local functions and its value to those living around it. Also, a serious technique to judge traffic scenes visually with the aid of artificial scenes has been tested and is now under further development.

An essential difference with our 1982 position is the incorporation, only a few years later, of the notion of 'perceptual priority' in our toolbox. With the model tableau and scene-coherence, perceptual priority has become an important part of our approach.

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ad <**Bibliographical notes**>
This part can be safely ignored, as of course it is terribly out of date. References for our present stage would need many pages. And, well, at the time we didn't want to fall into the trap of overdoing it.

**special section – about IWACC - a personal account**

IWACC started as a spin-off from a creative group of individuals, who around 1970 wanted to share their experience and skills, and present themselves to the outside world as a group. As it happened, the only part that survived that decade was a tiny sub-group of artists I had gathered around me, that were interested in the science, psychology and practice of pictorial representation, and in applying their skills and knowledge to other aspects of the human environment. As a consequence of this choice of subjects, we started to study the relevant material formally, helped by the fact that I myself already had some grounding in these fields.

While this was going on, in 1975 we were approached by Frank Stoovelaar, the specialist for two-wheeled vehicles of the Traffic Department of the Royal Dutch Touring Club ANWB, with whom we had been involved in the design of… book covers. He asked us to assist him in searching for improvements in the night-time visibility of bicycles. This resulted in the introduction of the afore-mentioned bicycle tyres, eventually adopted as legally required. The aim of this measure was not just enhancing the visiblity of the individual cyclist, but particularly the enhancement of drivers' perceptual priority for cyclists in dark conditions.

Over the following years we worked on many projects on behalf of a variety of clients. These included the aforesaid Traffic Department, branches of government like the *Directie Verkeersveiligheid* DVV (Directorate of Traffic Safety) and *Rijkswaterstaat* (The Department of Waterways and Public Works), and industry. All these projects were about one or another visual aspect of road traffic.

After 1982, our approach became more and more accepted as a valid take on things. In a lecture before the staff of the Foundation for Traffic Safety Research SWOV, subjects like model tableau, scene-coherence and perceptual priority were met with interest. In the course of that decade our work was more than once referred to in the publications of the SWOV, and in some of the projects members of that foundation collaborated with IWACC.

To this happy state of things came an abrupt end, when a series of incomprehensible conflicts, none of which involved the SWOV, caused the collapse of IWACC's three main workers. To understand this, one has to know that all three suffered from a form of extreme vulnerability to social stress. In fact, one of them never recovered at all and

a second had to permanently retreat from the life he had led before. I was the only one that managed to return to my area of interest – but only after a few years.

Even so, it took me almost 25 years to dare and reappear in public. And that was only because an old acquaintance asked me to try and help him in the matter of understanding the visual aspects of a traffic scene. And I only responded in a positive way, because I had learned to rely on the help of my wife Mieke. Years before she also had been a member of the IWACC team, and over the years she had participated more and more in my more esoteric interests.

The old acquaintance that re-enlisted IWACC's traffic expertise was Max van Kelegom, whom we had met while he was part of the ANWB Traffic Department. Long ago, on our request he had been given permission to take care of an important technical detail of one of our projects. Years later, he had started his own consultancy and project management firm VMC. In this capacity he had approached us in 2012, this time asking *us* to help *him*.

And so it came about that the combination Verkeer-Zien (Seeing Traffic) was formed, a collaboration between VMC and IWACC. Of course, this was something like a liberation. The only fly in the ointment is the unexpected and rather harsh resistance I ran into when trying to contact another old acquaintance – the SWOV. This is a rather serious problem, given my unusual problem of genetically based hypersensitivity to social stress. But maybe I'll survive this time :-)

Ruurd Groot

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