

# HORIZONTAL GAZE NYSTAGMUS: THE SCIENCE & THE LAW

## A Resource Guide for Judges, Prosecutors and Law Enforcement

### INTRODUCTION

Nystagmus is an involuntary jerking or bouncing of the eyeball that occurs when there is a disturbance of the vestibular (inner ear) system or the oculomotor control of the eye. Horizontal gaze nystagmus (HGN) refers to a lateral or horizontal jerking when the eye gazes to the side. In the impaired driving context, alcohol consumption or consumption of certain other central nervous system depressants, inhalants or phencyclidine, hinders the ability of the brain to correctly control eye muscles, therefore causing the jerk or bounce associated with HGN. As the degree of impairment becomes greater, the jerking or bouncing, i.e. the nystagmus, becomes more pronounced. This is assessed in the horizontal gaze nystagmus test.

The horizontal gaze nystagmus test is one of three field sobriety tests that comprise the standardized field sobriety test (SFST) battery (the other two tests are the walk-and-turn test and the one-leg-stand test). Scientific evidence establishes that the horizontal gaze nystagmus test is a reliable roadside measure of a person's impairment due to alcohol or certain other drugs.<sup>1</sup>

Despite the strong correlation between alcohol consumption and HGN, some trial courts across the country still do not admit the results of the HGN test into evidence. Although the scientific evidence to prove this correlation exists, due to lack of knowledge, inadequate preparation, or limited proffers, the evidence prosecutors have presented to courts has at times been insufficient to satisfy the courts' evidentiary standards for admitting scientific or technical evidence. As a result, law enforcement officers in a number of jurisdictions use the HGN test only for purposes of establishing probable cause if at all, without securing admission of the test results into evidence at trial. Ultimately, the factfinder never hears the results of the most reliable field sobriety test.

Legal and law enforcement communities need to better understand that HGN is the most reliable and effective indicator of alcohol impairment and that ample evidence is available to prove that reliability. The challenge is in conveying the strong correlation between the HGN test and impairment to the factfinder and showing how to effectively use the available evidence to prove the HGN test's validity and reliability in court.

This guide is designed especially to assist judges, prosecutors and law enforcement personnel in gaining a basic understanding of HGN, its correlation to alcohol and certain other drugs, other types of nystagmus, the HGN test's scientific validity and reliability, its admissibility in other jurisdictions, and the purposes for which it may be introduced. Specifically:

- Law enforcement officers will be able to understand why prosecutors ask questions regarding their training and experience in administering the HGN test, will be able to anticipate the types of questions that will be raised, and will be better prepared to respond to defense questions about the extent of their knowledge of the HGN test.
- Prosecutors will be better able to establish the scientific reliability of the HGN test under either the *Frye*<sup>2</sup> or *Daubert*<sup>3</sup> standard, to successfully articulate the HGN test's value to the factfinder, and

to build a strong trial record to appeal adverse trial court rulings.

- Judges will have a guide to evaluate and resolve issues regarding the reliability of the HGN test and the invalidity of arguments against the HGN test's admissibility.

Many issues addressed throughout this publication, such as the scientific reliability of the HGN test, may not apply to routine testimony in impaired driving cases once the state's appellate court accepts the HGN test. Nevertheless, all sections are helpful to the judge, prosecutor, and law enforcement officer who is unfamiliar with the subject matter or in need of review. For example, issues that may be applicable to every case include specifically how HGN occurs, how the test is administered, the qualifications and experience of the officer administering the test, and the purposes for which the HGN test result may be used.

This guide examines the use and application of the HGN test outside of the context of the SFST battery because courts may examine the issue of HGN as an independent test not related to other tests conducted by law enforcement officers. Although the HGN test is the most effective and reliable roadside sobriety test, law enforcement officers have not made arrest decisions and prosecutors have not obtained convictions based solely on the HGN test. The test should be used in the context for which it was developed: as one of the three roadside tests that make up the standardized field sobriety test battery.

The ultimate goal of this guide is to assist prosecutors and law enforcement officers in every jurisdiction to lay the foundation for the admissibility of the HGN test, and to encourage judges to accept the results of a properly administered HGN test as relevant evidence of impairment. The HGN test is the most effective roadside weapon against alcohol-impaired driving. It is not effective, however, if law enforcement officers and prosecutors do not use it or courts do not accept it.

## THE SCIENCE

### Section I: What is "Nystagmus"

"Nystagmus" is a term used to describe a "bouncing" eye motion that is displayed in two ways: (1) pendular nystagmus, where the eye oscillates equally in two directions, and (2) jerk nystagmus, where the eye moves slowly away from a fixation point and then is rapidly corrected through a "saccadic" or fast movement.<sup>4</sup> HGN is a type of jerk nystagmus with the saccadic movement toward the direction of the gaze. An eye normally moves smoothly like a marble rolling over a glass plane, whereas an eye with jerk nystagmus moves like a marble rolling across sandpaper. Most types of nystagmus, including HGN, are involuntary motions, meaning the person exhibiting the nystagmus cannot control it.<sup>5</sup> In fact, the subject exhibiting the nystagmus is unaware that it is happening because the bouncing of the eye does not affect the subject's vision.<sup>6</sup>

### Section II: Alcohol and Nystagmus

There are several types of nystagmus. Alcohol causes two types: alcohol gaze nystagmus, which includes HGN, and positional alcohol nystagmus. Although alcohol causes both, alcohol gaze nystagmus and positional alcohol nystagmus are very different and easily distinguishable. Testing for positional alcohol nystagmus is not a part of the standardized field sobriety test battery. Defendants sometimes claim or attempt to confuse matters by arguing that the nystagmus the officer saw was actually positional alcohol nystagmus and not alcohol gaze nystagmus.

For purposes of clarification the characteristics of both are described below.

### Alcohol Gaze Nystagmus (AGN)

Gaze nystagmus is a type of jerk nystagmus where the eye gazing upon or following an object begins to lag and has to correct itself with a saccadic movement toward the direction in which the eye is moving or gazing.<sup>7</sup> Gaze nystagmus is due to disruptions within the nervous system. Alcohol gaze nystagmus (AGN) is gaze nystagmus caused by alcohol. AGN occurs as the eye moves from looking straight ahead (called resting nystagmus), to the side (called HGN), or up (called vertical nystagmus or VGN). The effect of alcohol on eye movement has been described as follows:

Alcohol is a central nervous system depressant affecting many of the higher as well as lower motor control systems of the body. This results in poor motor coordination, sluggish reflexes, and emotional instability. The part of the nervous system that fine-tunes and controls hand movements and body posture also controls eye movements. When intoxicated, a person's nervous system will display a breakdown in the smooth and accurate control of eye movements. This breakdown in the smooth control of eye movement may result in the inability to hold the eyes steady, resulting in a number of observable changes of impaired oculomotor functioning.<sup>8</sup>

### Positional Alcohol Nystagmus (PAN)

Positional nystagmus occurs when a foreign fluid, such as alcohol, is in unequal concentrations in the blood and the fluid contained in semi-circular canals in the vestibular (inner ear) system. The vestibular system controls a person's balance, coordination and orientation. The eyes depend on the vestibular system to stabilize them against any head movement.<sup>9</sup> Disruptions in the vestibular system will have an adverse effect on the messages sent to the eyes when the head moves.<sup>10</sup> Positional nystagmus manifests itself as jerk nystagmus in which the direction of the saccadic movement depends on head movement.<sup>11</sup>

Positional alcohol nystagmus (PAN) occurs when alcohol is the foreign fluid. There exist two types of PAN. In PAN I, the alcohol concentration is higher in the blood than in the vestibular system fluid and occurs when a person's blood alcohol content (BAC) is *increasing*. In PAN II, the alcohol concentration is lower in the blood than in the vestibular system fluid and occurs when a person's BAC is *decreasing*.

Nausea, dizziness, vertigo and vomiting accompany PAN I and PAN II, which indicate high doses of alcohol.<sup>12</sup> High intensity PAN is evident when a subject's eyes are open, but open eyes block lower intensity PAN.<sup>13</sup> As a result, PAN is most easily recorded when the subject is lying down, head to the side with the eyes closed.<sup>14</sup>

### AGN and PAN Compared

In comparing AGN and PAN it is evident that both are caused by alcohol, yet their origins and manifestations are very different.<sup>15</sup> AGN is a neurological nystagmus while PAN is a vestibular system nystagmus.<sup>16</sup> Unlike AGN, PAN manifests itself only when the subject is lying down, with the head turned to the side and the eyes closed.<sup>17</sup> At low intensities, PAN stops when the eyes are open.<sup>18</sup> Furthermore, PAN changes direction depending on the position of the head while the direction of AGN depends on the direction of the gaze.<sup>19</sup> Because of these differences, officers conducting the HGN test are not likely to confuse AGN and PAN indicators.

### Section III: The HGN Test

#### Development of the Standardized Field Sobriety Test Battery

Law enforcement officers have used field sobriety tests (FST) to detect impairment and to develop probable cause to arrest.<sup>20</sup> Most FSTs test coordination, balance and dexterity, all of which diminish as a person reaches higher and higher BACs. Many FSTs also test a person's ability to perform simple tasks simultaneously because impairment limits the ability to divide attention among several activities at once. All FSTs assess to some degree the extent of a person's impairment. In 1977, law enforcement officers throughout the country were using different tests in a variety of ways with no scientific evidence of their effectiveness in detecting impairment. One of these tests was the HGN test.

Estimates of impaired driving rates and alcohol-related traffic injuries and fatalities prompted the National Highway Traffic Safety Administration (NHTSA) in 1977 to commission the Southern California Research Institute (SCRI) to determine the best methods of detecting impaired drivers using field sobriety tests. An underlying premise was that better detection methods would lead to more impaired driving arrests, higher conviction rates and ultimately lower incidents of impaired driving.

The 1977 SCRI study validated earlier observations regarding the relationship between HGN and alcohol consumption and found that the HGN test, along with the walk-and-turn (WAT) test, and the one-leg-stand (OLS) test, were easy FSTs to administer at roadside and the most accurate in detecting impairment.<sup>21</sup> Once the researchers identified the most accurate tests, they turned their attention to standardizing the administration of the tests in 1981.<sup>22</sup> Through standardization, the SCRI researchers ensured that law enforcement officers everywhere could administer the tests quickly, easily, effectively, and uniformly.<sup>23</sup> At that time, the researchers also found that when all three test results (HGN, WAT and OLS) were combined, it was possible to accurately determine whether an individual's BAC was .10 or higher eighty-three percent of the time.<sup>24</sup>

---

*Defendants often challenge the validity and the reliability of the HGN test. Validity is whether the test measures what it claims to measure. The validity of the HGN test can be established through the multitude of scientific articles, including the 1977 NHTSA study, that establish a correlation between HGN and the presence of alcohol. Reliability is whether the test repeatedly and consistently measures what it claims to measure. The 1981 NHTSA study tested the reliability of HGN and found that HGN occurs repeatedly and in multiple subjects as examined by multiple officers when alcohol is present.*<sup>25</sup>

---

After standardization, NHTSA funded a third study in 1983 to further corroborate these findings. Using data from the 1981 SCRI laboratory study, the NHTSA researchers determined that the HGN test was seventy-seven percent accurate in detecting whether an individual's BAC was .10 or higher.<sup>26</sup> The WAT test was found to be accurate sixty-eight percent of the time.<sup>27</sup> However, the NHTSA researchers found that when the results of the HGN and WAT test data were combined, the two tests were eighty percent accurate in detecting whether an individual's BAC was .10 or higher.<sup>28</sup> (See Appendix A for a copy of the matrix law enforcement officers use to combine HGN and WAT test scores.) Finally, the researchers predicted that the OLS test alone accurately indicated impairment sixty-five percent of the time.<sup>29</sup> NHTSA researchers then conducted a field study and confirmed the tests' ability to "effectively discriminate between drivers with BACs less than 0.10% and drivers with BACs equal to or over 0.10%."<sup>30</sup> The field study also concluded that the HGN test was the most "powerful" of the three tests.<sup>31</sup>

While these initial studies showed the accuracy of the HGN test, more recent studies demonstrate that the HGN test is even more accurate when administered by law enforcement officers trained and experienced in the administration of the HGN test. A 1986 study found the HGN test ninety-two percent accurate in detecting impairment.<sup>32</sup> A 1987 study found that experienced law enforcement officers were correct ninety-six percent of the time in determining a .10 BAC or more using the HGN test.<sup>33</sup>

The result of these studies was the standardized field sobriety test (SFST) battery used by law enforcement officers almost everywhere.<sup>34</sup> The purpose of the SFST battery, and especially the HGN test, is to increase the ability of law enforcement to: (1) identify drivers with BACs in the .08-.12 range that make up the bulk of the impaired drivers who do not necessarily exhibit exaggerated characteristic of impairment;<sup>35</sup> and (2) detect impairment in alcohol-tolerant drivers who may not display any gross coordination and balance problems.<sup>36</sup>

### Administering the HGN Test<sup>37</sup>

The HGN test is very easy to administer.<sup>38</sup> The officer must administer the test in a way that ensures that the subject's eyes can be seen clearly, i.e., in a well lit area or by use of a flashlight to illuminate the subject's face. The subject should not face toward the blinking lights of a police cruiser or passing cars, which may cause optokinetic nystagmus.<sup>39</sup> The subject does not have to be standing but can be sitting down. The law enforcement officer informs the subject "I am now going to check your eyes." The officer is not "testing" the subject's vision, as an ophthalmologist or optometrist would, but instead, the officer is "checking" the eyes for the physical manifestation of HGN.

Before checking the subject's eyes, the officer asks the subject to remove eyeglasses or inquires whether the subject is wearing hard or soft contact lenses. While the removal of the eyeglasses makes it easier for the officer to observe eye movement, glasses do not effect the HGN test results. Early concerns that contact lenses, especially hard contact lenses, may affect the HGN test result led some to provide for the subject to remove the lenses.<sup>40</sup> However, contact lenses, hard or soft, do not affect the test in any way. While hard contact lenses may pop out when the eye moves as far to the side as it will go, officers are not taught to have subjects remove contact lenses.<sup>41</sup> However, officers are taught to note whether the subject is wearing contacts and which type on the HGN Guide (shown on page 13).

The officer also asks the subject whether he or she has any medical impairment that would either prohibit the subject from taking the test or that would affect the test results. The officer should note on the HGN Guide any condition that prohibits the taking of the test and then move on to the remaining SFSTs. If the subject claims to have a natural nystagmus or any other condition that may affect the test result, but does not prohibit the taking of the HGN test, the officer should note the condition but still perform the test.

---

*The subject does not have to see the object clearly to perform the HGN test. The subject just has to see the object well enough to be able to follow it with his eyes. Blurry vision is not a medical condition that prohibits the subject from taking the test or performing satisfactorily.*

---

The HGN test requires only an object for subjects to follow with their eyes, such as a pen or the tip of a penlight.<sup>42</sup> The officer places the object approximately twelve to fifteen inches from the subject's face and slightly higher than eye level.<sup>43</sup> Placing the object above eye level opens the subject's eyes further

and makes their movement easier to observe. (See Appendix B, Picture 1.)

The officer instructs the subject to follow the object with the eyes and the head should remain still. If subjects have difficulty keeping their head still during the test, the officer is taught to have subjects hold their own head still by pressing the palms of their hands to their cheeks or to hold their own chin. The officer should try to avoid holding the subject's chin or using a flashlight as a chin rest because it brings the officer into contact with the subject and compromises officer safety. The officer then asks if the subject understands all the instructions.

After positioning the object, but before conducting the test, the officer checks for signs of medical impairment. First, the officer checks for "equal tracking" by moving the object quickly across the subject's entire field of vision to see whether the eyes follow the object simultaneously. The officer then checks for equal pupil size. Lack of equal tracking or equal pupil size may indicate blindness in one eye, a glass eye, a medical disorder or an injury. If the subject exhibits these characteristics, the officer should discontinue the HGN test and may need to seek medical assistance for the individual if a medical disorder or injury appears to exist.

**HORIZONTAL GAZE NYSTAGMUS**

	N	Y	hard	soft
Contact Lenses?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Equal Tracking?	<input type="radio"/>	<input type="radio"/>		
Equal Pupil Size?	<input type="radio"/>	<input type="radio"/>		
			LEFT	RIGHT
1. Lack of smooth pursuit?			<input type="radio"/>	<input type="radio"/>
2. Distinct nystagmus at maximum deviation?			<input type="radio"/>	<input type="radio"/>
3. Onset prior to 45 deg.?			<input type="radio"/>	<input type="radio"/>
NOTES:				

While conducting the test, the officer looks for six "clues," three in each eye, that indicate impairment. The officer should record the clues on the HGN Guide. The left eye is checked for the clue, and then the right eye. The clues are:

- **LACK OF SMOOTH PURSUIT** - The officer moves the object slowly but steadily from the center of the subject's face towards the left ear. The left eye should smoothly follow the object, but if the eye exhibits nystagmus, the officer notes the clue. The officer then checks the right eye. (See Appendix B, Picture 2.)

- **DISTINCT NYSTAGMUS AT MAXIMUM DEVIATION** - Starting again from the center of the suspect's face, the officer moves the object toward the left ear, bringing the eye as far over as possible, and holds the object there for four seconds. The officer notes the clue if there is a distinct and sustained nystagmus at this point. The officer holds the object at maximum deviation for at least four seconds to ensure that quick movement of the object did not possibly cause the nystagmus.<sup>44</sup> The officer then checks the right eye. This is also referred to as "end-point" nystagmus. (See Appendix B, Picture 3.)
- **ANGLE OF ONSET OF NYSTAGMUS PRIOR TO FORTY-FIVE DEGREES** - The officer moves the object at a speed that would take about four seconds for the object to reach the edge of the suspect's left shoulder. The officer notes this clue if the point or angle at which the eye begins to display nystagmus is before the object reaches forty-five degrees from the center of the suspect's face. The officer then moves the object towards the suspect's right shoulder. For safety reasons, law enforcement officers usually use no apparatus to estimate the forty-five degree angle. Generally, forty-five degrees from center is at the point where the object is in front of the tip of the subject's shoulder. (See Appendix B, Picture 4.)

The officer also checks for vertical nystagmus. The officer checks for vertical nystagmus by raising the object several inches above the subject's eyes. Vertical nystagmus is not one of the HGN clues nor is it a part of the SFST battery. However, vertical nystagmus is a good indicator of high doses of alcohol, other central nervous system (CNS) depressants or inhalants, and the consumption of the drug phencyclidine (PCP). The officer should note the result and take precautions if vertical nystagmus is evident.

After the HGN test is complete, the officer will conduct the WAT test and the OLS test. Then the officer will make the decision to arrest, release or take other action, such as seeking medical assistance for the subject. The officer may use a preliminary breath test to determine the individual's alcohol level. Ultimately, if the officer follows all of these clear procedures, the HGN test will be instrumental in giving the officer the information needed to make an accurate arrest decision.

---

*Defense attorneys who specialize in impaired driving cases know the SFST training manual as well as if not better than some law enforcement officers and many prosecutors, so any deviation from the manual, however slight, will be highlighted on cross examination, damaging the officer's, the prosecutor's and the HGN test's credibility.*

---

#### **Section IV: Other Types of Nystagmus**

There exist several non-alcohol related types of nystagmus caused by neural or muscle activity. These other types are due to a variety of causes, such as other vestibular system (inner ear) and nervous system disturbances and pathological disorders. Many times defendants will suggest that the nystagmus the law enforcement officer saw was actually caused by something other than alcohol or other drugs. However, a properly trained law enforcement officer will not mistake other types of nystagmus, natural or otherwise, with HGN when taking into account all of the facts that contribute to the arrest decision.

##### Nystagmus Caused by Non-Alcohol Related Disturbance of the Vestibular System

*Rotational nystagmus* is caused by a disturbance in the inner ear fluid when a person spins around. The nystagmus lasts only as long as the person is being spun. If an observer could see a person's eyes while that person was spinning, a distinct jerking of the eye would be evident. *Post-rotational nystagmus* occurs after the person stops spinning. The nystagmus lasts for several seconds and can easily

be seen.<sup>45</sup>

*Caloric nystagmus* is caused by the movement of the inner ear fluid due to a difference in temperature of the fluid between the left and right ear. One way this can occur is if warm water is poured in one ear and cold water is poured in the other.<sup>46</sup> Obviously this is an implausible scenario at roadside.

### Nystagmus Caused by Neural Activity

Some types of nystagmus are caused by neural or muscle activity. *Optokinetic nystagmus* occurs when the eyes fixate on an object that moves quickly out of sight or passes quickly through the field of vision, such as occurs when a subject watches utility poles pass by while in a moving car. Optokinetic nystagmus also occurs when the eyes watch an object displaying contrasting moving images, such as black and white spokes on a spinning wheel.<sup>47</sup> In either case, because the nystagmus is caused by the eye trying to catch up with the moving object, it lasts only as long as it takes for the object to stop moving, for the object to pass out of the field of vision, or for the eye to catch up to the object. *Epileptic nystagmus* is also a jerk nystagmus caused by neural activity that occurs primarily during epileptic or other types of seizures.<sup>48</sup>

In addition, some people will exhibit a slight eye tremor when the eye moves to maximum deviation. This tremor is due mostly to eye strain rather than to any type of alcohol impairment or medical condition. When the HGN test is administered properly, a law enforcement officer cannot confuse this eye tremor with HGN due to alcohol impairment for several reasons. First, the eye tremor lasts only briefly and law enforcement officers are taught to hold the eye at maximum deviation for at least four seconds to ensure that the jerking is sustained. Second, the officer is looking for a *distinct* nystagmus, not a *slight* eye tremor. And finally, distinct nystagmus at maximum deviation is only one clue among the three the officer is looking for when checking for HGN.

4 sec  
hold  
@  
moy  
devote

### Nystagmus Due to Pathological Disorders

Nystagmus may occur in people with brain damage, brain tumors or inner ear diseases. These disorders and others like them occur in a small number of the general population and even less often in drivers. Many of these alternative causes are so severe that it is unlikely that persons afflicted with the disorders would be driving, would not know they have the disorder or would be unaware of the effect the disorder has on their body. In addition, these types of nystagmus may be pendular rather than jerk nystagmus.

---

*One claim of impaired drivers exhibiting HGN is that fatigue and not alcohol is the cause of their impairment. NHTSA studies show that fatigue has no significant effect on the manifestation of HGN.*<sup>49</sup>

---

### Natural Nystagmus

The defense may argue that the nystagmus the law enforcement officer detected was actually a naturally occurring nystagmus rather than the result of alcohol impairment or any of the conditions listed above. As outlined below, the differences between any type of naturally occurring nystagmus and HGN are many and a properly trained officer will have no trouble distinguishing between the two at roadside.

Research indicates that a very small number of people exhibit a visible natural nystagmus.<sup>50</sup> Those who have natural nystagmus generally know they have it and will most likely tell the officer before the test is administered. Visible natural nystagmus is evident only at particular angles of gaze, but not before or



beyond that point.<sup>51</sup> However, when administering the HGN test, the law enforcement officer is looking for not only nystagmus at a particular angle of gaze, but smooth pursuit and end-point nystagmus as well. Furthermore, in making the ultimate decision of whether the subject is impaired, the law enforcement officer is continually taking into account other facts, such as the subject's performance on the other SFSTs, that suggest the subject is impaired by alcohol or other drugs. The law enforcement officer will never base an arrest decision solely on the results of the HGN test.

### Physiological Nystagmus

*Physiological nystagmus* exists in every person's eye in order to keep the eye from tiring when fixated on one point. This nystagmus occurs so that light entering the eye will continually fall on non-fatigued cells of the retina. Physiological nystagmus cannot be seen with the naked eye and is controlled by a part of the brain system other than that affected by alcohol impairment. Because the officer can easily see HGN caused by alcohol with the naked eye, there is virtually no chance that a law enforcement officer could confuse physiological nystagmus with HGN.

The HGN test is designed to check the eyes for one type of nystagmus horizontal gaze nystagmus. Its results are not invalidated by virtue of the fact that other types or causes of nystagmus exist. As shown above, the various types of nystagmus manifest themselves in different ways. Law enforcement officers will not confuse HGN with any other type of nystagmus if the HGN test is conducted correctly. Research shows that the HGN test is a valid and reliable indicator of alcohol impairment and is the most effective roadside test for impaired drivers.

---

*Although HGN is the most effective and reliable field sobriety test, do not allow the trial to turn into a referendum on HGN. The HGN test is only one of many pieces of evidence that the prosecution has available to prove that the defendant was impaired.*

---

## **THE LAW**

### **Section V: HGN in the Courtroom**

HGN finds its way into the courtroom as one of the SFSTs. Besides chemical blood and breath tests, the HGN test is the best evidence that the defendant ingested alcohol.<sup>52</sup> However, the HGN test provides the best evidence only if the factfinder (either the judge or jury) understands that the test result correlates with a degree of impairment.

There are several issues that may affect the admissibility of HGN test results:

1. Whether the HGN test is characterized as scientific or as simply an observation of a physical trait;
2. If HGN is deemed scientific, whether it is reliable;
3. Whether the law enforcement officer is properly trained to administer the HGN test;
4. Whether the officer properly administered the test in the particular case; and
5. The purpose for which the HGN test result will be used.

### Observation of a Physical Characteristic or Scientific Test

Jurisdictions treat the HGN test in one of two ways: (1) as an observation of a physical characteristic like other SFSTs or (2) as scientific evidence. Where there is no precedent, the prosecutor may advocate that the results of the HGN test are not scientific evidence, "extracted from empirical testing conclusions,"<sup>53</sup>

but rather observations by the law enforcement officer of a physical characteristic of a subject.

### *Determination of HGN as Observation of a Physical Characteristic*

When at all possible, the prosecution should convey to the trial court that the HGN test is a method for the law enforcement officer to observe a physical characteristic of the subject, i.e., an involuntary jerking of the eyeballs. This position is preferable for the prosecution because it focuses on the law enforcement officer's ability to observe a suspect's physical characteristics, and to interpret those characteristics on the basis of the officer's training and experience. Some state courts have taken this position and held that the HGN test is similar to the other two SFSTs in that HGN is a physical manifestation of alcohol impairment, like a staggering gait, that can be readily observed by a law enforcement officer.<sup>54</sup> These state courts found that the HGN test is "objective in nature and does not require expert interpretation," just like the WAT and OLS tests.<sup>55</sup> These courts also distinguish the HGN test from scientific tests, like polygraph tests, in that the HGN test does not require a measuring or recording instrument.<sup>56</sup>

To qualify HGN evidence as a physical observation, the prosecution should show that the HGN test operates on the same physiological principles as the other SFSTs, i.e. alcohol impairs muscle control. The only foundation required is a showing of the officer's training and experience in administering the test, and a showing that the test was in fact properly administered.<sup>57</sup> The law enforcement officer must establish his or her proficiency in conducting the test in order to make the correct observations. To do this, the law enforcement officer testifies about his or her training and experience with the HGN test (e.g., When and where trained? How many classroom hours? Did the officer perform the test on sober and impaired subjects in the classroom and how many times? How many times has the officer given the HGN test in the field?). The officer must also testify that the HGN test was properly administered in accordance with his or her training. In other words, the prosecutor lays the same foundation as if the law enforcement officer was testifying about the WAT or OLS. With that foundation, the HGN test results are admissible as evidence of impairment. The prosecutor may also argue that it is common knowledge that alcohol affects muscle control based on the physical observations of the suspect.

While no expert testimony is needed to get the HGN test admitted into evidence at trial, as a practical matter, some demonstration to the fact finder of the HGN test's reliability as an indicator of impairment may be needed. When the HGN test is admitted as a physical observation, the law enforcement officer can establish this reliability. The officer would explain that, based on the officer's training and experience in the interpretation and administration of the HGN test to impaired subjects, the officer can accurately identify that a subject is impaired when he or she performs unsatisfactorily on the HGN test.<sup>58</sup> For example, the officer may testify that he or she has observed people impaired by alcohol on many occasions and in various settings, and has noted a strong correlation between alcohol consumption and HGN.<sup>59</sup> To be persuasive to the fact finder, at trial the officer should take the opportunity to communicate evidence of the HGN test's reliability. Otherwise, the significance of the HGN test as the most reliable of SFST of alcohol impairment will be lost.

### *Determination of HGN as a Scientific Test*

The majority of state courts hold that the HGN test is a scientific test, resting upon the scientific principle that there is a relationship between alcohol consumption and HGN rather than it being simply an observation or common knowledge.<sup>60</sup> (See Appendix C for a chart summary and Appendix D for a textual summary of each state's HGN case law.) In jurisdictions with no appellate decisions on HGN test

evidence, trial courts must make the determination of whether the HGN test meets certain evidentiary standards and the trier of fact must accept the test. Initially, the trial court has the role of "gatekeeper."<sup>61</sup>

In performing its role as "gatekeeper," the trial court ensures that the trier of fact does not attach an undue aura of reliability to "scientific" evidence that is not scientifically valid. Evidence that purports to be based on science beyond the common knowledge of the average person that does not meet the judicial standard for scientific validity can mislead, confuse, and mystify the jury.<sup>62</sup>

Procedurally, the trial court may perform this "gatekeeper" role by holding an evidentiary hearing.<sup>63</sup> At that hearing, it is within the discretion of the trial court to determine what scientific evidence the jury will hear.

The two most common evidentiary standards for scientific evidence are (1) the *Frye* standard and (2) the Federal Rules of Evidence (FRE) or *Daubert* standard. Which standard a court applies depends on the law of the individual jurisdiction. The primary purpose of each of these standards is to ensure that the evidence is reliable and not junk science. The principal difference between them is how each measures that reliability.

#### Frye Standard

In 1923, the Court of Appeals for the District of Columbia held in *Frye v. United States*<sup>64</sup> that for new or novel scientific evidence to be admissible, it must "have gained general acceptance in the particular field in which it belongs." This standard came to be known as the *Frye* standard.<sup>65</sup> Technically there are two prongs to the *Frye* standard:

1. identifying the "particular field" or relevant scientific community; and
2. demonstrating that novel scientific evidence (such as the HGN test) is generally accepted in that community.

Combined, both prongs provided a measure of the reliability of the scientific evidence.<sup>66</sup>

In 1986 in the seminal case of *State v. Superior Court (Blake)*, the Arizona Supreme Court examined which fields of science constituted the relevant scientific community required by *Frye* before determining that the HGN test was generally accepted in that community. The court first found that "the work of highway safety professionals and behavioral psychologists who study effects of alcohol on behavior is directly affected by the claims and application of the HGN test, so that both these groups must be included in the relevant scientific community."<sup>67</sup> The court also found that the relevant scientific community should include the fields of neurology and criminalistics, but to a lesser extent because neither of those fields focus specifically on HGN and alcohol.<sup>68</sup> Other courts have agreed with the *State v. Superior Court (Blake)*'s conclusions.<sup>69</sup>

One or more witnesses must be called regarding general acceptance in the relevant community. Before any witness can testify about general acceptance, however, the court must qualify the witness as an expert. There is no bright line test under *Frye* governing when a court must qualify a witness as an expert. The expert must impart to the jury knowledge within the scope of the expert's special skill and experience that is otherwise unavailable to the jury from other sources.<sup>70</sup> Courts measure the quality of the witness's special skill and experience in terms of years of study and work experience, degrees and

other accolades received, research performed and publications written, among other things. How to use witnesses to prove general acceptance of the HGN test in these communities is addressed below.

It is important to point out that although evidence may rest on scientific principles, *Frye* only applies to scientific evidence that is "new or novel." At least one state court that applied a relevancy standard for determining the admissibility of scientific evidence found that the HGN test was not novel for the purpose of showing some indication of alcohol.<sup>71</sup> The court admitted the HGN test in conjunction with the results of the other SFSTs. This is a minority position, however.

In recent years courts and commentators alike have criticized the *Frye* standard as being too likely to exclude relevant evidence, too difficult to apply, too vague and undefinable.<sup>72</sup> Some courts have rejected *Frye* altogether to allow in more relevant evidence.<sup>73</sup> However, in those states that still adhere to it, the *Frye* standard remains essentially unchanged.

### Federal Rules of Evidence or *Daubert* Standard

In 1993, the United States Supreme Court held in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*<sup>74</sup> that the Federal Rules of Evidence (FRE), specifically Rule 702, replaced the common law *Frye* standard as the evidentiary basis for admitting scientific evidence<sup>75</sup> in federal courts.<sup>76</sup> The Supreme Court found that Rule 702 does not incorporate the general acceptance requirement of the *Frye* standard, as a prerequisite for the admission of expert scientific testimony.<sup>77</sup> The result is a more liberal standard, which allows the factfinder to hear scientific evidence conditioned upon testimony indicating that the evidence to be admitted is both relevant to the issues involved at trial and reliable.

As with the *Frye* standard, a trial court using the FRE standard must qualify a witness to testify about the evidence at issue. Similar to the *Frye* standard, under the FRE standard a witness may testify about scientific or technical evidence based on "knowledge, skill, experience, training, or education" if this "will assist the trier of fact to understand the evidence or to determine a fact in issue."<sup>78</sup> If the witness satisfies these requirements, the prosecution can refer to the witness as an expert on the evidence. Unlike the *Frye* standard, however, the court does not make a specific determination of the relevant scientific community under the FRE standard. Instead, the court incorporates that determination into its decision of whether the testimony to be offered is scientific knowledge that will assist the trier of fact in understanding the evidence or issue.

---

*FRE and Frye jurisdictions look at the same measures of expertise to qualify experts, i.e., years of study and work experience, degrees and other accolades received, research performed and publications written. Keep in mind that even though a court may qualify a witness as an expert, the defense is still free to attack the witness's qualifications and damage the witness's credibility as an "expert."*

---

As part of its assessment of whether the evidence should be admitted, the trial court must assess whether the reasoning or methodology underlying the testimony is scientifically valid and whether the reasoning or methodology can be applied to the facts in issue. The *Daubert* Court did not endorse any one method of determining the reliability of scientific evidence under the FRE.<sup>79</sup> However, the Court did suggest several factors which, among others, may be relevant in this determination. The first is whether the theory or technique applied "can be (and has been) tested."<sup>80</sup> The second is whether the theory or technique has been published and subjected to peer review.<sup>81</sup> The third is whether there is a "known or

potential rate of error" and whether there are standards to control the operation of the technique.<sup>82</sup> Finally, the Court stated that *Frye's* "general acceptance in the scientific community" standard is still a consideration, but relegated it to one factor among many to consider in determining the reliability of a scientific theory or technique.<sup>83</sup>

Keep in mind that a court's "new or novel" determination is a threshold question only in states using the *Frye* standard.<sup>84</sup> It is not a requirement in the FRE standard.<sup>85</sup> In *Daubert* the Supreme Court explained that:

Although the *Frye* decision itself focused exclusively on "novel" scientific techniques, we do not read the requirements of Rule 702 to apply specially or exclusively to unconventional evidence. Of course, well-established propositions are less likely to be challenged than those that are novel, and they are more handily defended. Indeed, theories that are so firmly established as to have attained the status of scientific law, such as the laws of thermodynamics, properly are subject to judicial notice under Fed. Rule Evid. 201.<sup>86</sup>

Considering this language, courts may find that scientific evidence that is not "new or novel" already comes with a large degree of reliability, so that no further inquiry is needed. However, some FRE states have taken the *Frye* standard's "new or novel" requirement to determine whether to apply *Daubert*.<sup>87</sup>

The Supreme Court in *Daubert* clearly indicated that the FRE standard applies only to federal trials involving scientific evidence, and did not preempt the states from following the standard they choose.<sup>88</sup> In *Kumho Tire Co. v. Carmichael*, the Court extended *Daubert's* "gatekeeping" obligation to all expert testimony.<sup>89</sup> Most states that did not adopt the FRE continue to follow the *Frye* standard.<sup>90</sup> Many of the states that adopted the FRE follow the *Daubert* rationale.<sup>91</sup> Other FRE states disagree with the *Daubert* rationale and continue to follow the *Frye* standard.<sup>92</sup> Still other states, regardless of whether they adopted the FRE or not, have established their own scientific standards.<sup>93</sup> (See Appendix E for chart summarizing the scientific standards for each state.)

### Meeting the Scientific Standard of the Jurisdiction

To date the courts have determined that HGN evidence does meet *Frye* and is, therefore, admissible at trial; with one exception.<sup>94</sup> Some courts have held that the prosecution failed to

present sufficient evidence for the trial court to make findings as to the scientific reliability of the HGN test.<sup>95</sup> In these cases, the prosecution generally relied solely on the testimony of the arresting officer to establish the reliability of the HGN test.

To demonstrate that the HGN test meets the scientific standard of the jurisdiction, a prosecutor can ask that the trial court take judicial notice of the validity and reliability of the HGN test as found in case law from other jurisdictions.<sup>96</sup> This allows the prosecution and the defendant to avoid the cost of expert testimony. If required, the prosecutor will present evidence at an evidentiary hearing. There are two types of evidence the prosecution should use: expert testimony and scientific studies. The prosecution should use both types of evidence to show that the HGN test is valid, reliable, and meets the appropriate scientific standard. Moreover, more than half of the states have admitted HGN test results either to establish probable cause in a criminal case or as substantive evidence of intoxication. The prosecution should also make these cases available to the trial court. (See Appendix C.)

---

*Although a minority of courts have been willing to take judicial notice of the HGN test's reliability, the better and safer practice may be to move for an evidentiary hearing. Do not wait for the defense to file a motion challenging the admissibility of the test results.*

---

### *HGN at the Evidentiary Hearing*

#### Scientific Studies and Case Law

Initially, a prosecutor should comply with the requirements of the local jurisdiction such as, filing a motion requesting an evidentiary hearing and asking the court to set a briefing schedule. In addition, the prosecution should file a memorandum of points and authorities prior to the hearing with sufficient opportunity for the court to become familiar with the scientific literature on HGN and its use as a field sobriety test.

---

*Appellate courts will not consider new issues or evidence on appeal that the prosecution did not present to the trial court. Make sure that all evidence is admitted and preserved for the record.*

---

Provide the original studies conducted for NHTSA by the SCRI and subsequent validation studies to the court. In addition, append articles from the scientific literature. It is helpful to include scientific literature from disciplines other than law enforcement, particularly when arguing for admissibility under *Frye* to establish general acceptance. (See Appendix F for a bibliography of studies and articles on HGN and related topics.)

---

*The most important studies regarding the validity and reliability of HGN are the three original NHTSA studies establishing the SFST battery. At a minimum these studies should be provided to the court. Subsequent validation studies, such as the Colorado validation study conducted in 1995 by SCRI, should also be included. Also, scientific articles on HGN and other types of nystagmus are helpful in explaining and defining scientific terms. Contact the National Traffic Law Center for copies of many of the studies and articles listed in Appendix F.*

---

Although courts have found law enforcement to be part of the relevant scientific community under existing case law, the court is more likely to accept HGN if the prosecution can show a wider acceptance.

*Frye* requires the proponent of the evidence to prove general acceptance in the relevant scientific community. In *Daubert*, the Court stated in dicta that evidence that satisfied *Frye* would also satisfy the requirements of FRE 702.<sup>97</sup> Therefore, cases that hold that the HGN test is scientifically reliable under *Frye* are relevant to an inquiry under the FRE or other state standard. However, cases decided under a different standard may be irrelevant to prove reliability under *Frye*.

---

*Defendants often file motions to suppress the HGN test results with cites to secondary authorities criticizing the HGN test. Usually these cites are to defense-oriented journals or manuals written by attorneys, not to scientific articles. The prosecution should cite primary authority, such as the NHTSA studies or medical journals. Do not cite to articles written by attorneys, either defense or prosecution.*

---

#### Expert Witnesses

The purpose for calling expert witnesses is to establish that:

1. there is a correlation between alcohol impairment and HGN;
2. the HGN test is a valid test for alcohol impairment;
3. the test is reliable;
4. a police officer can be trained to accurately administer and interpret the test results;
5. officers are unlikely to mistake alcohol-induced nystagmus for other forms of nystagmus.

Regardless of the scientific standard at issue, if an expert is required, the officer who administered the test will rarely be qualified to testify about the relation of alcohol to nystagmus (except for his or her observations), comment on the NHTSA studies or the scientific literature, or establish general acceptance or the relevant scientific community.<sup>98</sup> At the evidentiary hearing, the court will confine the officer's testimony to training and experience in administering the test, administration of the test to the defendant, and the defendant's test results. The court should allow the officer to testify that he or she has administered the test to impaired and unimpaired persons and identify the differences in the test results. In the context of this discussion, since the court has not yet deemed HGN admissible, the decision to arrest the defendant is largely irrelevant at this point. See (Appendix H for predicate questions for the arresting/SFST officer.)

The scientific standard at issue will largely determine the type(s) of expert(s) the prosecution will call. There is no magic number of experts nor is there a particular type or combination of experts the prosecution must use. The following examples are based on cases in which the HGN test was subjected to an evidentiary hearing.

Dr. Marcelline Burns, a research psychologist and Director of the Southern California Research Institute, often testifies on challenges to the HGN test. The SCRI conducted the original research for NHTSA to identify the most effective field sobriety tests. Further testing by SCRI resulted in the selection of the HGN test as one of the SFSTs. Dr. Burns continues to be involved in additional validation studies on the merits of the HGN test.

Dr. Burns' field of study is the effects of alcohol and drugs on behavior and performance. A witness such as Dr. Burns can establish the scientific validity of the HGN test, its selection as one of the SFSTs and its reliability. It is helpful for the witness to testify as to the ability of police officers to effectively use and interpret HGN test results. The testimony of a professional within the scientific research field is also important in establishing the relevant scientific community. (See Appendix I for predicate questions at an evidentiary hearing and at trial.)

Although not essential, often the prosecution's case is advanced by testimony of a medical expert. This is particularly important in a *Frye* jurisdiction to establish general acceptance. The prosecution can call an expert from any number of professions to testify regarding the reliability of HGN as a test for alcohol impairment. For example, an optometrist, ophthalmologist, neurologist, emergency room or urgent care physician may all be qualified to discuss the effect of alcohol on eye movements. The expert should be able to distinguish alcohol-induced nystagmus from other types of nystagmus, including natural nystagmus. The expert should also have an opinion about whether an officer can be trained to administer and interpret HGN results. Other experts the prosecution may call are toxicologists or pharmacologists. These individuals often have expertise in the effects of alcohol on the human body.

---

*The American Optometric Association has passed a resolution endorsing the HGN test as an effective test for alcohol impairment. If using an optometrist as a witness, have a copy of the resolution*

*available. It will enhance the credibility of your witness. The resolution will also tend to diminish the credibility of a defense optometrist who opposes HGN. (See Appendix G for a copy of the American Optometric Association's resolution).*

---

It may be important to have a witness from the law enforcement community. This expert should have special expertise in the use of the HGN test. Typically this witness would be an instructor in the SFSTs or a Drug Recognition Expert who has received specialized training in detecting impaired drivers. The officer should be able to testify about the training officers receive in administering the test and about the reliability of the test. Many officers maintain an HGN log where they record the results of the test and the actual chemical test results. This information is helpful to the court on the issue of reliability and an officer's ability to correctly administer and interpret the test results.

Not all medical professionals have studied the effects of alcohol on humans nor routinely encounter patients who are under the influence. An expert who has studied the effects of alcohol, who actually uses nystagmus testing and is familiar with the protocol specified for HGN in the standardized field sobriety testing manual is the best expert. It is beneficial if the expert has seen a law enforcement officer administer the test to impaired subjects. At a minimum, the expert should review the protocol and be able to give an opinion as to its validity as a test for alcohol impairment and whether a properly trained officer is capable of administering the test and interpreting the results. The expert should also be able to discuss acceptance of the HGN test in his or her particular field. The prosecutor and the expert witness must thoroughly prepare to ensure that the expert's testimony is clear, concise, and conveys to the factfinder the high degree of validity and reliability of the HGN test. (See the appendices for examples of predicate questions for various experts, including a SFST/DRE instructor (Appendix J), an optometrist (Appendix K), and an emergency room physician (Appendix L).)

In many jurisdictions a prosecutor's time is short and funding is limited. Gathering experts together to testify about HGN may not be feasible. However, in jurisdictions with no precedent, courts that deem the HGN test scientific will require expert testimony unless they are willing to take judicial notice of the HGN test's validity and reliability. Prosecutors should make every effort to select a test case, secure the necessary funding and provide expert testimony required by the court to get the HGN test admitted in their state.

---

*It is highly recommended that someone of similar background and experience to Dr. Burns be called as an expert in HGN test cases. Experts from other fields, such as ophthalmology or toxicology, can also be called to testify about the NHTSA studies and the validity and reliability of the HGN test. All experts:*

- 1. must read and be familiar with the NHTSA studies; and*
- 2. should be trained in the use of the HGN test.*

*Contact the National Traffic Law Center for more information about possible experts and funding options for expert witnesses.*

---

### *HGN at Trial*

In addition to meeting standards for admissibility, most jurisdictions require the prosecution to lay some foundation before the factfinder can hear the evidence. The foundation often consists of two parts: establishing a correlation between alcohol impairment and HGN, and the qualifications of the police officer that administered the test.

The prosecution may call the same types of experts who testified at the evidentiary hearing at trial to



establish this correlation, although it is unnecessary for the prosecution to present the same extensive testimony at trial as may be presented at the evidentiary hearing. However, the evidence needs to be sufficient to persuade the trier of fact that a correlation exists between alcohol impairment and HGN and to withstand appellate review.

---

*Once a state's highest court has found the HGN test reliable, it will generally be unnecessary to call expert witnesses at trial to establish the nexus between alcohol impairment and HGN. However, prosecutors may still want to consider using expert testimony. Often an expert can more readily convince the factfinder of the test's validity.*

---

Unless the court qualified the law enforcement officer as an expert on HGN, the officer may not testify about the defendant's impairment in those jurisdictions that require expert testimony concerning the correlation between alcohol impairment and HGN at trial.<sup>99</sup> When an officer testifies about the other tests in the SFST battery, the officer can offer a lay opinion regarding the defendant's sobriety because of the common characteristics of impairment that require no specialized knowledge to understand.<sup>100</sup> However, where HGN is viewed as scientific evidence, the officer can only state the results of the test, not that they correlate with any degree of impairment.

Qualifying the officer to testify about the HGN test results is similar to qualifying the officer to testify about any other FST. The prosecutor should place particular emphasis on the officer's training and experience in administering the test. The officer should describe administering the test under controlled conditions to subjects who were not impaired and those who were and the differences the officer saw. The officer must also testify that the test was administered correctly in the case at trial.<sup>101</sup> For instance, a panel of the Georgia Court of Appeals found that the trial court was correct in permitting a police officer, who had received specialized training in DUI detection and had worked with a DUI task force for two years, to testify about the HGN test results.<sup>102</sup> The Montana Supreme Court found an officer qualified to testify about HGN test results. The Montana Law Enforcement Academy had certified the officer after completing the requisite number of training hours.<sup>103</sup> This training and experience, coupled with testimony that the officer administered the test properly, is enough foundation to enable the officer to testify about the results of the test.<sup>104</sup>

#### Purpose and Limits of HGN Test Results

Courts have allowed the prosecution to use HGN test results for several purposes. Although not specifically addressed in many jurisdictions, courts generally accept the HGN test as a basis for probable cause to arrest without showing that the test meets the applicable scientific standard.<sup>105</sup> Some states have addressed this issue in the context of administrative license revocation proceedings, where the standard of proof for revocation is also probable cause to arrest.<sup>106</sup>

Once the court accepts HGN as a reliable indicator of impairment, it is evidence of impairment.<sup>107</sup> Although the HGN test is an excellent indicator of impairment, the test results alone are not used to convince a jury that a defendant was impaired.<sup>108</sup> Combined with other evidence of impairment, such as erratic driving, odor of an alcoholic beverage, glassy or blood-shot eyes or unsatisfactory performance on other SFSTs, HGN is strong evidence of impairment.

---

*The HGN test and other field sobriety tests do not test directly a subject's ability to drive a car.*

*Instead, they measure the mental and physical skills necessary to drive a car safely, such as muscle control and divided attention.*

---

Many law enforcement officers are so experienced in giving the HGN test that they can estimate very closely a person's BAC based on the results, especially by examining the angle of onset. Despite this ability, to date no court has allowed an officer to testify as to a specific BAC based on HGN because the HGN test is not a statutorily approved method of determining a subject's BAC and the angle of onset is estimated without a precise measuring device.<sup>109</sup> However, an expert can testify to the fact that research has verified the reliability of the HGN test in distinguishing between persons with a .10 BAC or higher and persons with a BAC lower than .10. Unless a law enforcement officer is qualified as such an expert, which is rare, the officer cannot testify to this fact.

## CONCLUSION

Impaired driving detection and prosecution has improved since the initial 1977 NHTSA study, due in large part to the use of the SFST battery by law enforcement on the street and prosecutors in the courtroom. However, efforts to reduce impaired driving in many parts of the United States could not fully benefit from administering the SFST battery because of the exclusion of the HGN test from some impaired driving trials. The effectiveness of the SFST battery to curb impaired driving cannot be achieved to its full potential unless all of the three tests are utilized throughout the country.

To achieve further improvement, the HGN test should be administered by law enforcement in the field, introduced into evidence by prosecutors in the courtroom and accepted by judges as reliable. For this to happen, a basic understanding of both the science and the law behind the HGN test is needed. HGN is based on simple scientific principles and is readily understood. A considerable body of scientific evidence supports its validity and reliability. Once law enforcement personnel, prosecutors and judges understand HGN, they will realize how vital HGN evidence is in detecting, prosecuting and convicting impaired drivers.

---

<sup>1</sup> Humphrey Belton, *Lateral Nystagmus: A Specific Diagnostic Sign of Ethyl Alcohol Intoxication*, 100 N.Z. Med. J. 534, 535 (Aug. 1987).

<sup>2</sup> *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

<sup>3</sup> *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

<sup>4</sup> Raymond D. Adams & Maurice Victor, *Principles of Neurology*, ch.13, "Disorders of Ocular Movement and Pupillary Function," 117 (4<sup>th</sup> ed. 1991).

<sup>5</sup> C.J. Forkiotis, *Optometric Exercise: The Scientific Basis for Alcohol Gaze Nystagmus*, 59 Curriculum II, No. 7 at 9 (April 1987); Gregory W. Good & Arol R. Augsburg, *Use of Horizontal Gaze Nystagmus as a Part of Roadside Sobriety Testing*, 63 Am. J. of Optometry & Physiological Optics 467, 469 (1986).

<sup>6</sup> There have been some studies that suggest that HGN due to alcohol impairment may affect the ability of a person to see clearly. See June M. Stapleton, et al., *Effects of Alcohol and Other Psychotropic Drugs on Eye Movements: Relevance to Traffic Safety*, 47 Q.J. Stud. on Alcohol 426, 430 (1986).

<sup>7</sup> See Forkiotis, *supra* note 5, at 9.

<sup>8</sup> Jack E. Richman & John Jakobowski, *The Competency and Accuracy of Police Academy Recruits in the Use of the*

*Horizontal Gaze Nystagmus Test for Detecting Alcohol Impairment*, 47 New Eng. J. Optometry 5, 6 (Winter 1994).

<sup>9</sup> David A. Robinson, *Eye Movement Control in Primates*, 161 Science 1219 (Sept. 1968).

<sup>10</sup> See L. Goldberg, *Effects and After-Effects of Alcohol, Tranquilizers and Fatigue on Ocular Phenomena*, Alcohol and Road Traffic 123, 125-28 (1963).

<sup>11</sup> *Id.* at 128.

<sup>12</sup> *Id.* at 126.

<sup>13</sup> *Id.*

<sup>14</sup> Eye movements with the eyes closed were recorded with electro-oculography, which utilizes electrodes placed at the outer corners, under and over the eye. *Id.* at 124.

<sup>15</sup> Gunnar Aschan, *Different Types of Alcohol Nystagmus*, 140 Acta Oto-laryngol 69, 76 (Sweden 1958); Goldberg, *supra* note 10, at 128.

<sup>16</sup> National Highway Traffic Safety Administration, U.S. Department of Transportation, *Development and Field Test of Psychophysical Tests for DWI Arrest*, No. DOT-HS-805-864 at 79-83 (March 1981) [hereinafter *1981 NHTSA Study*].

<sup>17</sup> Goldberg, *supra* note 10, at 124-28.

<sup>18</sup> *Id.*

<sup>19</sup> Aschan, *supra* note 15, at 76-77.

<sup>20</sup> Field sobriety tests encompass any exercise a law enforcement officer asks an impaired driving suspect to perform along the roadside to test for impairment. The standardized field sobriety test battery consists only of the horizontal gaze nystagmus test, the walk-and-turn test and the one-leg-stand test.

<sup>21</sup> National Highway Traffic Safety Administration, U.S. Department of Transportation, *Psychophysical Tests for DWI Arrests*, No. DOT-HS-802-424 at 39 (June 1977) [hereinafter *1977 NHTSA Study*].

<sup>22</sup> *1981 NHTSA Study*, *supra* note 16, at 3.

<sup>23</sup> *Id.*

<sup>24</sup> *Id.* at 2. A later field study, using standardized procedures for administering the three FSTs, showed that ninety-three percent of the decisions to arrest and eighty-six percent of the decisions to arrest or release were correct. Colorado Department of Transportation, *A Colorado Validation Study of the Standardized Field Sobriety Test (SFST) Test Battery*, 14 (Nov. 1995) [hereinafter *A Colorado Validation Study*].

<sup>25</sup> A measure of HGN reliability requires multiple measurement. For test-retest reliability, the same officers must examine the same subjects at the same BAC on a second occasion. For inter-officer reliability, two or more officers must examine the same subjects independently.

Reports of officer accuracy in percentages are not measures of reliability. They are important measures in that they serve to validate the test battery. That is, if officers make a high percentage of correct decisions based on the test battery, then it is valid.

Validity and reliability are linked. An unreliable test (one that gives varying results from one time to another) cannot be a valid test. Note that reliability is measured with coefficients in the range of -1 (no reliability) to +1 (perfect reliability).

<sup>26</sup> National Highway Traffic Safety Administration, U.S. Department of Transportation, *Field Evaluation of a Behavioral Test*

*Battery for DWI*, No. DOT-HS-806-475 at 4 (Sept. 1983) [hereinafter *1983 NHTSA Study*]. NHTSA research found that HGN may be evident when a person's BAC reaches approximately .06 BAC. *1977 NHTSA Study*, *supra* note 21, at 7. Some studies have found that horizontal gaze begins to break down at even lower BAC levels. See I.M.S. Wilkinson et al., *Alcohol and Human Eye Movement*, 97 *Brain* 785, 791 (1974) (finding that smooth pursuit begins to break down at .04 BAC); Good & Augsburger, *supra* note 5, at 468 (stating that some changes in horizontal gaze begin at .03 BAC).

<sup>27</sup> *Id.*

<sup>28</sup> *Id.*

<sup>29</sup> *Id.*

<sup>30</sup> *1983 NHTSA Study*, *supra* note 26, at 11.

<sup>31</sup> *Id.*

<sup>32</sup> Good & Augsburger, *supra* note 5, at 471.

<sup>33</sup> Forkiotis, *supra* note 5, at 4. See also *A Colorado Validation Study*, *supra* note 24, at 14 (finding that experienced law enforcement officers were accurate ninety-three percent of the time in deciding to arrest when using the SFST battery).

<sup>34</sup> Marcelline Burns, *The Use of Horizontal Gaze Nystagmus as a Field Sobriety Test*, Proceedings, 35<sup>th</sup> International Congress on Alcoholism and Drug Dependence, Oslo, Norway at 1 (1988) [hereinafter Burns, *The Use of HGN*]. The HGN test is also part of the twelve-step drug recognition evaluation protocol, which law enforcement uses to detect drivers under the influence of drugs other than alcohol.

<sup>35</sup> See *id.* at 1.

<sup>36</sup> See *A Colorado Validation Study*, *supra* note 24, at 19.

<sup>37</sup> Description of the administration of the HGN test is taken from National Highway Traffic Safety Administration, U.S. Department of Transportation, *DWI Detection and Standardized Field Sobriety Testing Student Manual VIII-14 - 18* (1995) [hereinafter *Student Manual*].

<sup>38</sup> Cf. Belton, *supra* note 1, at 535 (advocating the teaching of HGN to the public through repeated demonstrations on television).

<sup>39</sup> Optokinetic nystagmus is evident when an object that the eye fixates upon moves quickly out of sight or passes quickly through the field of vision, such as occurs when watching utility poles pass by while in a moving car. See *infra* note 47 and accompanying text (defining optokinetic nystagmus).

<sup>40</sup> *1981 NHTSA Study*, *supra* note 16, at 7.

<sup>41</sup> *Student Manual*, *supra* note 37, at VIII-15.

<sup>42</sup> Research has shown that the characteristics of the stimulus used, including size, shape and brightness, have no effect on the HGN test results. Forkiotis, *supra* note 5, at 11.

<sup>43</sup> There are several state appellate court cases that incorrectly include "covering one eye" as part of the administration of the HGN test. See, e.g., *State v. Superior Court (Blake)*, 718 P.2d 171, 173 (Ariz. 1986); *State v. Clark*, 762 P.2d 853, 856 (Mont. 1988). Subjects were asked to cover one eye in the initial NHTSA study. *1977 NHTSA Study*, *supra* note 21, at 13. However, when the test was standardized this requirement was dropped. *1981 NHTSA Study*, *supra* note 16, at 85. NHTSA's research showed that "monocular versus binocular fixation" was an "unimportant variable." *Id.* at 7. Other research demonstrates that the angle of onset occurs much sooner when one eye is covered. See Aschan, *supra* note 15, at 73. Therefore, NHTSA recommends that the HGN test not be performed on subjects with abnormal eye disorders or a glass eye. *Student Manual*, *supra* note 37, at VIII-14.

- <sup>44</sup> This type of nystagmus is called "optokinetic nystagmus." See *infra* note 47 and accompanying text (describing optokinetic nystagmus).
- <sup>45</sup> John Leigh & David S. Zee, *The Neurology of Eye Movements*, ch. 9, "Diagnosis of Central Disorders of Ocular Motility," 192 (2<sup>nd</sup> ed. 1983).
- <sup>46</sup> Adams & Victor, *supra*, note 4, at 111. Note that caloric nystagmus does not occur when a person is seated in a heated car with the window open, allowing cold air into the vehicle.
- <sup>47</sup> *Id.* There is research that has found that barbiturates suppress or eliminate optokinetic nystagmus while causing HGN. M.B. Bender & F.H. O'Brien, *The Influence of Barbiturate on Various Forms of Nystagmus*, 29 Am. J. Ophthalmology 1541, 1552 (1946).
- <sup>48</sup> Peter W. Kaplan & Ronald Tusa, *Neurophysiologic and Clinical Correlations of Epileptic Nystagmus*, 43 Neurology 2508, 2513 (Dec. 1993).
- <sup>49</sup> 1981 NHTSA Study, *supra* note 16, at 10-11.
- <sup>50</sup> *Id.* at 9; Forkiotis, *supra* note 5, at 11.
- <sup>51</sup> Forkiotis, *supra* note 5, at 11.
- <sup>52</sup> See *supra* notes 30 - 36 and accompanying text (detailing the accuracy of the HGN test).
- <sup>53</sup> *United States v. Everett*, 972 F. Supp. 1313, 1319 (D.Nev. 1997)(emphasis added).
- <sup>54</sup> See *id.* at 158; *City of Fargo v. McLaughlin*, 512 N.W.2d 700, 706 (N.D. 1994); *State v. Nagel*, 506 N.E.2d 285, 286 (Ohio Ct. App. 1986); *State v. Sullivan*, 426 S.E.2d 766, 769 (S.C. 1993); *Salt Lake City v. Garcia*, 912 P.2d 997, 1000 (Utah Ct. App. 1996); *State v. Peters*, 419 N.W.2d 575, 578 (Wis. Ct. App. 1987). While numerically this is a minority, in cases where the HGN test is accepted as scientific evidence, it was offered as such.
- <sup>55</sup> See, e.g., *Murphy*, 451 N.W.2d 154, 157 (Iowa 1990); *Nagel*, 506 N.E. 2d at 286.
- <sup>56</sup> See, e.g., *McLaughlin*, 512 N.W.2d at 707; *Nagel*, 506 N.E.2d at 286.
- <sup>57</sup> *City of Fargo v. McLaughlin*, 512 N.W.2d 700, 708 (N.D. 1994).
- <sup>58</sup> See *Garcia*, 912 P.2d at 1001.
- <sup>59</sup> *Id.*
- <sup>60</sup> *State v. Witte*, 836 P.2d 1110, 1121 (Kan. 1992). See also *Ma'one v. City of Silverhill*, 575 So.2d 106, 107 (Ala. 1990); *State v. Superior Court (Blake)*, 718 P.2d 171, 178 (Ariz. 1986); *People v. Joehnk*, 35 Cal. App. 4<sup>th</sup> 1488, 1507-08, 42 Cal. Rptr. 2d 6, 38 (Cal. Ct. App. 1995); *State v. Ruthardt*, 680 A.2d 349, 356 (Del. Super. Ct. 1996); *State v. Meador*, 674 So. 2d 826, 834 (Fla. Dist. Ct. App. 1996); *Manley v. State*, 424 S.E.2d 818, 819 (Ga. Ct. App. 1992); *State v. Garrett*, 811 P.2d 488, 490 (Idaho 1991); *People v. Buening*, 592 N.E.2d 1222, 1227 (Ill. App. Ct. 1992); *State v. Armstrong*, 561 So. 2d 883, 887 (La. Ct. App. 1990); *Schultz v. State*, 664 A.2d 60, 62 (Md. Ct. Spec. App. 1995); *State v. Berger*, 551 N.W.2d 421, 424 (Mich. Ct. App. 1996); *State v. Klawitter*, 518 N.W.2d 577, 584 (Minn. 1994); *Young v. City of Brookhaven*, 693 So.2d 1355, 1360-61 (Miss. 1997); *State v. Hill*, 865 S.W.2d 702, 703 (Mo. Ct. App. 1993), *rev'd on other grounds*, *State v. Carson*, 941 S.W.2d 518, 520 (Mo. 1997); *State v. Clark*, 762 P.2d 853, 856 (Mont. 1988); *State v. Borchardt*, 395 N.W.2d 551, 556 (Neb. 1986); *State v. Torres*, 1999 N.M. Lexis 55 (N.M. 1999); *People v. Quimm*, 580 N.Y.S.2d 818, 826 (Dist. Ct. 1991), *rev'd on other grounds*, 607 N.Y.S.2d 534 (App. Div. 1993); *State v. Helms*, 490 S.E.2d 565 (N.C. 1997); *Yell v. State*, 856 P.2d 996 (Okla. Crim. App. 1993); *State v. O'Key*, 899 P.2d 663, 670 (Or. 1995); *Commonwealth v. Miller*, 532 A.2d 1186, 1188 (Pa. Super. 1987); *State v. Murphy*, 953 S.W.2d 200 (1997); *Emerson v. State*, 880 S.W.2d 759, 763 (Tex. Crim. App. 1994); *State v. Cissne*, 865 P.2d 564, 569 (Wash. Ct. App. 1994); *State v. Barker*, 366 S.E.2d 642, 644-45 (W. Va. 1988).

<sup>61</sup> *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 588 (1993). See also *Kumho Tire Co. v. Carmichael*, 119 S. Ct. 1167 (1999).

<sup>62</sup> *O'Key*, 899 P.2d at 678 n.20.

<sup>63</sup> See *infra* notes 96-97 and accompanying text (discussing the evidence presented in an evidentiary hearing for HGN).

<sup>64</sup> 293 F. 1013 (D.C. Cir. 1923). In *Frye*, the Court of Appeals affirmed a lower court ruling excluding the results of a polygraph test offered by a defendant charged with second-degree murder. *Id.* at 1013-14.

<sup>65</sup> *Id.* at 1014.

<sup>66</sup> See *State v. Merritt*, 647 A.2d 1021, 1024 n.3 (Conn. App. Ct. 1994); *State v. Witte*, 836 P.2d 1110, 1117 (Kan. 1992).

<sup>67</sup> *State v. Superior Court (Blake)*, 718 P.2d 171, 180 (Ariz. 1986).

<sup>68</sup> See *id.*

<sup>69</sup> See also *People v. Joehnk*, 35 Cal. App. 4<sup>th</sup> 1488, 1507, 42 Cal. Rptr. 2d 6, 17 (1995); *State v. O'Key*, 899 P.2d 663, 685-86 (Or. 1995).

<sup>70</sup> *United States v. Jackson*, 425 F.2d 574, 576 (D.C. Cir. 1970); *State v. Tran*, 847 P.2d 680, 686 (Kan. 1993).

<sup>71</sup> *Whitson v. State*, 863 S.W.2d 794, 798 (Ark. 1993).

<sup>72</sup> E.g. Paul C. Gianelli, *The Admissibility of Novel Scientific Evidence: Frye v. United States, a Half-Century Later*, 80 Colum. L. Rev. 1197, 1223-28 (1980).

<sup>73</sup> See *infra* notes 75 - 81 and accompanying text (discussing the *Daubert* alternative to the *Frye* test).

<sup>74</sup> 509 U.S. 579 (1993). In *Daubert*, the Supreme Court ruled that the plaintiffs, children born with birth defects, could introduce expert testimony on the issue that the defendant's product, Bendectin, caused the birth defects even though the expert's theory of causation was not generally accepted in the relevant scientific community. *Id.* at 598.

<sup>75</sup> Fed. R. Evid. 702. Rule 702 states:

Testimony by Experts If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.

<sup>76</sup> *Daubert*, 509 U.S. at 592.

<sup>77</sup> *Id.*

<sup>78</sup> *Id.*

<sup>79</sup> *Id.* at 593; *State v. O'Key*, 899 P.2d 663, 678 (Or. 1995).

<sup>80</sup> *Daubert*, 509 U.S. at 593.

<sup>81</sup> *Id.* at 594.

<sup>82</sup> *Id.*

- <sup>83</sup> *Id.* See also *State v. Pennell*, 584 A.2d 513, 515 (Del. Super. Ct. 1989); *O'Key*, 899 P.2d at 679; *Commonwealth v. Sands*, 675 N.E.2d 370, 373 (Mass. 1997).
- <sup>84</sup> See *supra* notes 64 - 73 and accompanying text (describing the *Frye* standard).
- <sup>85</sup> See *supra* note 75 and accompanying text (describing the Federal Rules of Evidence Standard).
- <sup>86</sup> *Daubert*, 509 U.S. at 593.
- <sup>87</sup> *Prater*, 820 S.W.2d 429, 433 (Ark. 1991); *State v. Pennell*, 584 A.2d 513, 515 (Del. Super. Ct. 1989).
- <sup>88</sup> *Daubert*, 509 U.S. at 587.
- <sup>89</sup> *Kumho Tire Co. v. Carmichael*, 119 S. Ct. 1167 (1999).
- <sup>90</sup> *People v. Leahy*, 882 P.2d 321 (Cal. 1994); *Jones v. United States*, 548 A.2d 35 (D.C. App. 1988); *Smith v. Deppish*, 807 P.2d 144 (Kan. 1991); *People v. Hughes*, 453 N.E.2d 484 (N.Y. 1983); *Commonwealth v. Zook*, 615 A.2d 1 (Pa. 1992).
- <sup>91</sup> *State v. Coon*, 1999 Alas. Lexis 28 (Alaska 1999); *State v. Prater*, 820 S.W.2d 429 (Ark. 1991); *State v. Pennell*, 584 A.2d 513 (Del. Super. Ct. 1989); *State v. Crea*, 806 P.2d 445 (Idaho 1991); *Steward v. State*, 652 N.E.2d 490 (Ind. 1995); *State v. Hall*, 297 N.W.2d 80 (Iowa 1980); *Cecil v. Commonwealth*, 888 S.W.2d 669 (Ky. 1994); *State v. Foret*, 628 So.2d 1116 (La. 1993); *State v. Williams*, 388 A.2d 500 (Me. 1978); *Commonwealth v. Lanigan*, 641 N.E.2d 1342 (Mass. 1994); *State v. Clark*, 762 P.2d 853 (Mont. 1988); *Santillanes v. States*, 765 P.2d 1147 (Nev. 1988); *State v. Alberico*, 861 P.2d 192 (N.M. 1993); *State v. Pennington*, 393 S.E.2d 847 (N.C. 1990); *State v. Williams*, 446 N.E.2d 444 (Ohio 1983); *Taylor v. State*, 889 P.2d 319 (Okla. Crim. App. 1995); *State v. Brown*, 687 P.2d 751 (Or. 1984); *State v. Wheeler*, 496 A.2d 1382 (R.I. 1985); *State v. Hofer*, 512 N.W.2d 482 (S.D. 1994); *State v. Johnson*, 117 S.W.2d 298 (Tenn. Crim. App. 1986); *Kelly v. State*, 824 S.W.2d 568 (Tex. Crim. App. 1992); *State v. Crosby*, 927 P.2d 638 (Utah 1996); *State v. Brooks*, 643 A.2d 226 (Vt. 1993); *State v. Woodall*, 385 S.E.2d 253 (W. Va. 1989); *State v. Walstad*, 351 N.W.2d 469 (Wis. 1984); *Rivera v. State*, 840 P.2d 933 (Wyo. 1992).
- <sup>92</sup> *State v. Bible*, 858 P.2d 1152 (Ariz. 1993); *Fishback v. People*, 851 P.2d 884 (Colo. 1993); *Flanagan v. State*, 625 So.2d 827 (Fla. 1993); *State v. Montalbo*, 828 P.2d 1274 (Hawaii 1992); *People v. Baynes*, 430 N.E.2d 1070 (Ill. 1981); *Reed v. State*, 391 A.2d 364 (Md. 1978); *People v. Young*, 340 N.W.2d 805 (Mich. 1983); *State v. Jobe*, 486 N.W.2d 407 (Minn. 1992); *Polk v. State*, 612 So.2d 381 (Miss. 1991); *State v. Davis*, 814 S.W.2d 593 (Mo. 1991); *State v. Reynolds*, 457 N.W.2d 405 (Neb. 1990); *State v. Vandebogart*, 616 A.2d 483 (N.H. 1992); *State v. Spann*, 617 A.2d 247 (N.J. 1993); *State v. Brown*, 337 N.W.2d 138 (N.D. 1983); *State v. Martin*, 684 P.2d 651 (Wash. 1984).
- <sup>93</sup> *State v. Porter*, 698 A.2d 739 (Conn. 1997) (creating a standard based on *Daubert* and emphasizing scientific validity); *Harper v. State*, 292 S.E.2d 389 (Ga. 1982) (creating a standard even more liberal than the FRE); *State v. Ford*, 392 S.E.2d 781 (S.C. 1990) (creating a less restrictive standard than the *Frye* standard but different from the FRE, which the state has adopted); *O'Dell v. Commonwealth*, 364 S.E.2d 491 (Va. 1988) (adopting a standard that focuses on reliability).
- <sup>94</sup> *Young v. City of Brookhaven*, 693 So.2d 1355, 1358 (Miss. 1997). The court did allow law enforcement to use HGN test evidence for probable cause determinations. *Id.* at 1360.
- <sup>95</sup> See, e.g., *State v. Armstrong*, 561 So.2d 883, 885 (La. Ct. App. 1990). The admissibility of the HGN test in the courts of California, a *Frye* state, is a good example of the effectiveness of expert testimony and existing literature about the HGN test. In *People v. Loomis*, 156 Cal. App. 3d Supp. 1, 7, 203 Cal. Rptr. 767, 771 (1984), the appellate court reversed a defendant's conviction on two grounds. First, the state failed to lay the proper foundation to establish the scientific reliability of the HGN test. The police officer and no experts testified. Second, the police officer attempted to quantify the defendant's BAC. *Id.* at 8, 203 Cal. Rptr. at 773. In *People v. Leahy*, 882 P.2d 321, 34 Cal. Rptr. 2d 663 (Cal. 1994), the state relied solely on the police officer and again the court reversed the conviction for failure to establish the scientific reliability of the HGN test. *Id.* at 323, 34 Cal. Rptr. 2d at 665. The court finally admitted HGN test results in *People v. Joehnk*, 35 Cal. App. 4<sup>th</sup> 1488, 42 Cal. Rptr. 2d 6 (1995). In that case, the state presented three experts who testified about the acceptance of the HGN test in relevant scientific communities, as well as studies to show its reliability. Compare *State v. Reed*, 732 P.2d 66, 69 (Or. Ct. App. 1987) (rejecting HGN when state presented arresting police officer's testimony only) with *State v. O'Key*, 899 P.2d 663, 682 n.34 (Or. 1995) (admitting HGN when state presented testimony of four experts and arresting police officer).

<sup>96</sup> See *Hawkins v. State*, 476 S.E.2d 803, 808-09 (Ga. Ct. App. 1996) (court judicially noticed that HGN test is a reliable scientific test); *People v. Buening*, 592 N.E.2d 1222, 1227 (Ill. App. Ct. 1992) (judicially noticing decisions of other courts to hold that HGN test meets the *Frye* standard); *State v. Taylor*, 694 A.2d 907, 912 (Me. 1997) (court took judicial notice of the reliability of the HGN test to detect impaired drivers); *Schultz v. State*, 664 A.2d 60, 74 (Md. Ct. Spec. App. 1995) (holding that the HGN test is a reliable indicator of alcohol impairment and of its acceptance in the relevant scientific community). *But see* *People v. Kirk*, 681 N.E.2d 1073, 1077 (Ill. App. Ct. 1997) (criticizing the court in *People v. Buening*, *supra*, for judicially noticing decisions of other courts); *State v. Helms*, 490 S.E.2d 565, 568 (N.C. Ct. App. 1997) (declining to take judicial notice of the HGN test's reliability based on the record before it); *State v. Cissne*, 865 P.2d 564, 569 (Wash. Ct. App. 1994) (same).

<sup>97</sup> See *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 587 (1993).

<sup>98</sup> See *Leahy*, 882 P.2d at 323, 34 Cal. Rptr. 2d at 665 (1994). *But see* *State v. Ruthardt*, 680 A.2d 349, 361-62 (Del. Super. Ct. 1996) (holding that a police officer may be qualified to testify about the underlying scientific principles that correlate HGN with alcohol).

<sup>99</sup> While a court rarely qualifies a law enforcement officer to give this type of testimony, there is nothing prohibiting an officer who is qualified to testify. *Ruthardt*, 680 A.2d 349, 361-62 (Del. Super. Ct. 1996).

<sup>100</sup> *People v. Williams*, 3 Cal. App. 4<sup>th</sup> 1326, 1332, 5 Cal. Rptr. 2d 130, 134 (1992).

<sup>101</sup> *Schultz v. State*, 664 A.2d 60, 74 (Md. Ct. Spec. App. 1995) and cases cited therein.

<sup>102</sup> *Manley v. State*, 424 S.E.2d 818, 820 (Ga. Ct. App. 1992).

<sup>103</sup> *State v. Clark*, 762 P.2d 853, 857 (Mont. 1988).

<sup>104</sup> *Id.* See also *State v. Armstrong*, 561 So.2d 883, 887 (La. Ct. App. 1990); *State v. Bresson*, 554 N.E.2d 1330, 1335-36 (Ohio 1990).

<sup>105</sup> *State v. Grier*, 791 P.2d 627, 631 (Alaska Ct. App. 1990); *State v. Superior Court (Blake)*; 718 P.2d 171, 178 (Ariz. 1986); *State v. Merritt*, 647 A.2d 1021, 1026 n.4 (Conn. App. Ct. 1994). *Cf.* *State v. Ruthardt*, 680 A.2d 349, 354 (Del. Super. Ct. 1996); *State v. O'Key*, 899 P.2d 663, 681 n.30 (Or. 1995).

<sup>106</sup> See, e.g., *Muscatell v. Cline*, 474 S.E.2d 518, 525 (W.Va. 1996).

<sup>107</sup> *Whitson v. State*, 863 S.W.2d 794, 798 (Ark. 1993); *Sieveling v. State*, 469 S.E.2d 235, 236 (Ga. Ct. App. 1996); *Armstrong*, 561 So.2d at 887; *State v. Hill*, 865 S.W.2d 702, 704 (Mo. Ct. App. 1993), *rev'd on other grounds*; *State v. Carson*, 941 S.W.2d 518, 520 (Mo. 1997); *Bresson*, 554 N.E.2d at 1336.

<sup>108</sup> See, e.g., *State v. Garrett*, 811 P.2d 488, 491 (Idaho 1991) (stating "standing alone [an HGN test result] does not provide proof positive of DUI, because many other factors may cause nystagmus").

<sup>109</sup> E.g., *Middleton v. State*, 780 S.W.2d 581, 583-84 (Ark. Ct. App. 1989); *Howard v. State*, 744 S.W.2d 640, 641 (Tex. App. 1987).