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# Dizziness and vertigo syndromes viewed with a historical eye

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**Abstract**
Seasickness, fear of heights, and adverse effects of alcohol were the major areas where descriptions of vertigo and dizziness were found in Roman, Greek, and Chinese texts from about 730 BC–600 AD. A few detailed accounts were suggestive of specific vestibular disorders such as Menière's attacks (*Huangdi Neijing, the Yellow Thearch's Classic of Internal Medicine*) or vestibular migraine (Aretaeus of Cappadocia). Further, the etymological and metaphorical meanings of the terms and their symptoms provide fascinating historical insights, e.g. Vespasian's feelings of dizzy exultations when becoming Emperor (69 AD) after Nero's suicide or the figurative meaning of German "Schwindel" (vertigo) derived from English "swindle" to express "financial fraud" in the Eighteenth century. The growth of knowledge of the vestibular system and its functions began primarily in the Nineteenth century. Erasmus Darwin, however, was ahead of his times. His work *Zoonomia, or The Laws of Organic Life* in 1794 described new dizziness syndromes and concepts of sensorimotor control including the mechanism of fear of heights as well as made early observations on positional alcohol vertigo. The latter is beautifully illustrated by the German poet and cartoonist Wilhelm Busch (1832–1908) who also documented the alleviating effect of the "morning after drink". The mechanism underlying positional alcohol vertigo, i.e., the differential gravities of alcohol and endolymph, was discovered later in the Nineteenth century. The first textbook on neurology (*Lehrbuch der Nervenkrankheiten des Menschen*, 1840) by Moritz Romberg contained general descriptions of signs and symptoms of various conditions having the key symptom of vertigo, but no definition of vestibular disorders. Our current knowledge of vestibular function and disorders dates back to the seminal work of a group of Nineteenth century scientists, e.g., Jan Evangelista Purkinje, Ernst Mach, Josef Breuer, Hermann Helmholtz, and Alexander Crum-Brown.

**Keywords** Vertigo · Dizziness · Antiquity · Erasmus Darwin · Moritz Romberg · Wilhelm Busch

## Introduction

When searching historical texts dating from Antiquity for the terms vertigo and dizziness, it is necessary and useful to consider their etymological meanings.

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## Etymology

Latin, for example, has at least two source words to describe the condition vertigo. "Vertigo" in Latin refers to turning, spinning, rotating and is derived from the verb "vertere", meaning to turn. Another word "caligo" means darkening of the eyes, funereal crape, and dizziness. It, and not the word "vertigo", appears in ancient text passages referring to heights ("altitudo") and symptoms of fear of heights [1, 2]. The word "caligo" was also used metaphorically for dizziness arising from feelings of exultation or for being overwhelmed and losing one's grip on reality. For example, Tacitus in his work *Historiae* describes how Vespasian wanted to become an Emperor himself after Nero's suicide: he is said to have felt dizzy when the soldiers addressed him as "Emperor" and used other high-ranking titles [3].

The Germanic languages also provide fascinating etymologies for words used to describe symptoms of

dizziness. The word giddy is believed to be derived from the Old English word "gidig", meaning insane or, literally, possessed by a god. The *Oxford Dictionary of English* [4] defines the word dizzy as 'having or involving a sensation of spinning around and losing one's balance.' It is said to originate in the Old English word "dysig", meaning foolish, and is thought to be related to Low German "dusig", meaning giddy, and Old High German "tusic", which translates as foolish or weak [5]. From the Proto-Germanic root "swimen" meaning to move to and fro, the various Indo-European languages developed words for the concepts: for example, Low German = "swajen" meaning to move to and fro as with the wind and Middle High German = "swimen" meaning to sway about; Old Norse = "svimi" meaning to swoon; Norwegian = "svime; svima" meaning to stagger; Dutch "zwaaien" = to sway about.

The development in English took an unexpected turn: from Old English = "swima" meaning "Schwindel"; or from Old English "swäman" meaning "zwerven", to Middle English = "sweigh, sweye" meaning a sweeping or swinging motion. Modern English has derived "sway". Two Indo-European roots led to the development of two meanings in English: to sway and to swindle. In German, the original meaning led to the medical term "Schwindel". Apparently, the second figurative meaning of "Betrug" (in English 'fraud') arose gradually from the Sixteenth century on and was derived from the English "swindler" first appearing in the Eighteenth century when German Jews in England began using the term "schwindel" < German pronunciation for English 'swindle' > to express the concept of "financial fraud". By the Nineteenth century, the meaning of "Betrug" for "Schwindel" was in use in German [6–9].

### Definitions

The current medical definitions of vertigo, dizziness, and imbalance are based on the recommendations made by the classification committee of the International Bárány Society for Neuro-Otology. "Vertigo is the sensation of self-motion when no self-motion is occurring; dizziness is the sensation of disturbed or impaired spatial orientation without a false or distorted sense of motion; and imbalance or unsteadiness is the feeling of being unstable while sitting, standing, or walking without a particular directional preference" [10]. All three sensations can occur in peripheral, central and higher vestibular disorders [11].

## Vertigo and dizziness in ancient texts

Our interest in ancient descriptions of disorders with the key symptoms such as vertigo, dizziness, and unsteadiness led to a systematic search in historical European and Chinese texts. The period covered included Greek texts beginning with Homer in 730 BC to the late Roman texts and ending with Aetios Amidenos in 600 AD as well as the Chinese medical classics dating from 200 BC and extending to 800 AD. Three conditions that nowadays are classified as seasickness, fear of heights, and vertigo due to alcohol consumption were described especially often. Even a few accounts seemed to suggest more specific disorders such as Menière's disease and vestibular migraine [2, 3, 12–15]. Obviously, the interpretation of ancient texts is not unproblematic. The least of the many difficulties are that of translation into a modern language. A greater obstacle is the differences in culture, views of the world and the human being's role in it, as well as accepted concepts of disease and medicine [16]. Moreover, the pathophysiological conceptions now and then differ greatly. Nevertheless, a descriptive analysis can bring to light intriguing facts, views, and myths.

### Seasickness/Motion sickness

The ancient Romans/Greeks and Chinese were quite familiar with seasickness as witnessed by numerous descriptions of seasickness, its triggers, symptoms, and measures to prevent it. Body movements caused by waves were known to be the critical stimuli. Especially, Greek and Roman texts evoke the roughness of seas and the unpleasantness of odors as major triggers, as well as symptoms of nausea, emesis, vertigo, anorexia, faintness, apathy, headache, and impending doom. It was also widely known that other illnesses and a person's current mental state, as well as anxiety could precipitate seasickness, but that experienced sailors were highly resistant (the influence of habituation) [3, 14]. The Chinese had observed that children are particularly susceptible to motion sickness [13], an observation that most modern parents make. This particular susceptibility of children occurs around the age of ten when being passively transported in vehicles [17]. The Chinese also described different types of motion sickness, e.g. cart sickness when traveling in carts or litter sickness when being transported on a litter or in a sedan chair [13].

Many Greek/Roman and Chinese sources emphasized the impact of seasickness on military actions, stressing such famous naval battles as the Battle of the Red Cliff, which marked the end of the Han dynasty in China, or—in later times—the defeat of the Spanish Armada by the English in 1588. A peculiar war-related form of motion sickness is associated with Napoleon's camel corps during the Egyptian campaign of 1798/1799, a sickness induced by riding on a camel, the "ship of the desert" [14].

Therapeutic measures differed according to the culture. The Western classics recommended looking at stationary contrasts on the coast, fasting or specific diets, pleasant fragrances, medicinal plants such as white hellebore

(containing various alkaloids but not scopolamine), or a mixture of wine and wormwood. In the East, more unusual measures were advocated, such as drinking the urine of young boys, swallowing white sand-syrup, collecting water drops from a bamboo stick, or hiding earth from the kitchen hearth under the hair [3, 13, 14]. One reason for these different therapeutic recommendations was obviously due to the different concepts of the underlying pathophysiology. The Greek view was based on the humoral theory of Empedokles and Aristoteles which considered an imbalance of the four body fluids ("χολή" = yellow bile, "φλέγηα" = phlegm, "μέλαινα χολή" = black bile, "αἷμα" = blood; [18]) to be causative, whereas the medicine of correspondences in China attributed malfunctions to certain body substances and the life force 'Qi' ([19]; Table 1).

## Fear of heights

Symptoms of fear of heights were described in ancient Roman/Greek and Chinese texts. European sources provide us with precise characterizations of the symptoms, such as worsening of eyesight and a feeling of uneasiness when walking over a bridge, the eyes being veiled with dizziness when standing on a high ladder, dizziness when gazing on high rocks, turning pale, trembling of the knees, and darkening of the eyes when looking from the heavens, or feeling dizzy when looking at high windows [2]. Chinese sources emphasize the effects of poor eyesight, confusion, and uncertainty. The Yellow Thearch observed that his fear of heights and anxiety when climbing up a watch tower were alleviated by kneeling. His observation that the severity of fear of heights depended on body position is well recognized today [12]. While the Romans were aware of the triggering factor 'visual height', the Chinese thought that it was the temperature at heights which caused a 'cold Qi' and was the provoking stimulus [20].

## Vertigo and alcohol

Wine was an important beverage in Roman and Greek Antiquity. Mostly it was mixed with water, but also mixtures with honey were common. Thus, it is not surprising that the effects of alcohol intake were known and described in various ancient texts. In one of the first epic narrations of mankind, the *Ilias*, about 730 BC, Homer alludes to the physical/mental effects of alcohol in the sixth book, where Hektor returning home to Troja after the slaughter of battle declines his mother Hekabe's offer to bring him honey-flavored wine for reinforcement. Hektor says [21, 22]:

"μή μοι οἶνον ἄειρε μελίφρονα, πότνια μῆτερ,

μή μ' ἀπογυιώσῃς, μένεος δ' ἀλκῆς τε λάθωμαι·"

„Reiche mir nicht den Wein, den honigsinnigen, hehre Mutter.
Daß du mir nicht die Glieder lähmst, und ich Mut und Kraft vergesse."

('Do not serve me honey-flavored wine honorable mother.
It lames my limbs and makes me forget courage and strength').

Juvenal (about 60–127 AD) describes the exclusively physical effects of rotatory alcoholic vertigo in the *Saturae* (Satires) [23, 24]:

"[…] quum bibitur concha, quum jam vertigine tectum ambulat et geminis exsurgit mensa lucernis."

"[…] and drinks out of perfume-bowls, while the roof spins around dizzy, the table dances, and every light is double."

## Allusions to specific vertigo syndromes: vestibular migraine and Menière's disease

In the second century AD, Aretaeus of Cappadocia describes in *De causis et signis acutorum et chronicorum morborum*

**Table 1** Table of the ancient Chinese view of the medicine of correspondences which represents the theory of the five phases of transformation: all objects are divided into five categories (wood, fire, earth, metal, water)

| Phase of change | Wood | Fire | Earth | Metal | Water |
|---|---|---|---|---|---|
| Yin organs | Liver | Heart | Spleen | Lung | Kidney |
| Yang organs | Gallbladder | Small intestine | Stomach | Large intestine | Bladder |
| Sense organs | Eyes | Tongue | Lips | Nose | Ears |
| Mental power | Breath soul/spirit | Mind ('shen') | Thoughts ('yi') | Physical soul | Will ('zhi') |
| Colors | Blue green | Red | Yellow | White | Black |
| Body structures | Tendons | Vessels/main channels/meridians | Flesh | Skin | Bones |

The concept of the life energy 'Qi' together with blood and the fluids accomplishes the interaction between the body entities [19]

a syndrome that combines hemicrania with vertigo and is associated with nystagmoid eye movements and nausea [15, 25]. These features resemble the symptoms of vestibular migraine, a term that was first coined only in 1999 [26]. Diagnostic criteria have in the meantime been jointly formulated by the Committee for Classification of Vestibular Disorders of the Bárány Society and the Migraine Classification Subcommittee of the International Headache Society (IHS) [27].

The Yellow Thearch reports in the Chinese Medical Classic *Huangdi Neijing* (second century BC to second century AD) on an episodic disorder with dizziness involving a connection between eyes and brain. The associated ringing noise in the ears strongly recalls the characteristics of a Menière's attack [15]. The full picture of the disease was first described and named by Prosper Menière in 1861 [28]. He stressed the characteristic recurrent attacks of vertigo, mostly for hours, combined with unilateral hearing loss, tinnitus, and a feeling of fullness in one ear. In 2015, the diagnostic criteria for Menière's disease were reformulated by several Otolaryngological Societies including the Committee for Classification of Vestibular Disorders of the Bárány Society [29].

## Insights from the Eighteenth/Nineteenth centuries on vertigo and motion perception

The history of the vestibular system encompasses only a little more than 120 years [30–32]. Although the function of the vestibular organ was not yet discovered in his lifetime, Erasmus Darwin (1731–1802 AD), the grandfather of Charles Darwin, provided posterity with a rich mine of information about the emergence of dizziness syndromes and the early concepts of sensorimotor control of eye movements and multisensory actions. In his work *Zoonomia, or The Laws of Organic Life* in 1794 [33], he describes a plethora of physiological dizziness syndromes: those that arise when viewing moving objects, from our own motions, from riding over snow or a broad stream, dizziness when looking from a tower, when turning on one foot, walking in the dark, or resulting from the motion of a ship (seasickness). Disorders or diseases accompanied by vertigo or dizziness are also mentioned, for example, disorders resembling the Mal de Debarquement syndrome, strokes of palsy with dizziness, injuries of the head, vertigo when inebriated, an upset stomach due to internal causes accompanied by vertigo, and vertiginous noises in the head (possibly Menière's disease). He also wrote about visual vertigo:

> "Many people, when they arrive at 50 or 60 years of age, are affected with slight vertigo; which is generally but wrongly ascribed to indigestion, but in reality arises from a beginning defect of their sight […] these people do not see objects so distinctly as formerly, and by exerting their eyes more than usual they perceive the apparent motions of objects, and confound them with real motions of them; and therefore cannot accurately balance themselves so as easily to preserve their perpendicularity by them."

Another example is his understanding of visual height intolerance (fear of heights):

> "Anyone, who stands alone on the top of a high tower, if he has not been accustomed to balance himself by objects placed at such distances and with such inclinations, begins to stagger, and endeavors to recover himself by his muscular feelings. During this time the apparent motion of objects at a distance below him is very great and the impressions of this apparent motion continue a little time after he has experienced them; and he is persuaded to incline the contrary way to counteract their effects; and either immediately falls, or applying his hands to the building, uses his muscular feeling to preserve his perpendicular attitude, contrary to the erroneous persuasions of the eyes."

Erasmus Darwin also described rotatory vertigo due to drinking excessively alcohol:

> "[…] such is the vertigo of drunken people, which continues, when their eyes are closed, and themselves in a recumbent posture, as well as when they are in an erect posture, and have their eyes open."

Here, Darwin observed the typical symptoms of positional alcohol nystagmus in supine position. Much later, the Nobel prize winner Robert Bárány (1911) defined the direction-changing characteristics of positional alcohol nystagmus in humans when different head positions are assumed (nystagmus beating towards the undermost ear) [34]. The second phase of positional alcohol vertigo/nystagmus on the following day (with reversal of rotatory vertigo and nystagmus with a direction beating toward the uppermost ear) was first observed in 1954 by Walter [35]. The mechanism of positional alcohol nystagmus phase I and phase II is attributed to the difference in the specific weights of endolymph and alcohol. Alcohol is lighter than endolymph, and when blood levels approach 40 mg/dl, alcohol diffuses into the cupula, rendering it lighter than endolymph and thereby transforming the semicircular canal into gravity-sensitive receptors [36]. The "morning after" drink of alcohol may re-equalize the specific gravities of alcohol and the vestibular endolymph, thus reducing the untoward symptoms [37].

Although unaware of the function of vestibular semicircular canals, Wilhelm Busch (1832–1908), a German humorist, cartoonist and poet amusingly illustrated the effects of excessive alcohol consumption: "Ein Abenteuer

in der Neujahrsnacht" ("An adventure on New Year's Eve"), "Der Katzenjammer am Neujahrsmorgen" ("The hangover on New Year's Day") [38]. In the first cartoon, a rotatory vertigo is depicted with a spinning bed and room while the affected subject is lying down (Fig. 1). The second cartoon shows that Busch already knew about the "stabilizing morning-after drink" (Fig. 2).

## Vertigo/dizziness in the Nineteenth/Twentieth century and nowadays

Moritz Heinrich Romberg (1795–1873), an innovative German physician in Berlin, is considered to be the "first clinical neurologist and the cofounder of the "German Neurological School". By publishing the first systematic textbook on neurology, his *Lehrbuch der Nervenkrankheiten des Menschen* [39], he revolutionized European neurology. This first textbook contains a chapter on 'Vertigo, Schwindel'. In this chapter, he delineated symptoms, frequency, characteristics, causes, and therapeutic measures of vertigo. He emphasizes that apparent motions lead to falls and rotations, either of one's own body or the surroundings, which cause a feeling of disturbed balance. This is often accompanied by optical or acoustical hyperesthesia (flickering before the eyes, noise in the ear—possibly allusions to vestibular migraine and Menière's disease), double vision, painful feelings in the head, nausea and emesis, anxiety with attacks of cold sweating, trembling of the muscles, quick pulse, red or pale face, and cold feet. Moreover, he states that vertigo attacks last minutes, rarely longer. They may occur transiently or chronically. The causes are said to be a general state of weakness such as reconvalescense, injuries and diseases of the cerebrum, especially the cerebellum and the pons, ingestion of alcohol, narcotics or nicotine, or other toxic substances such as digitalis or hyoscyamus. Morever, vertigo may occur as a prodromal state of other diseases, especially those associated with fever, when the patient assumes a certain head position over a longer time (bending down), or during unfamiliar movements such as occur during a sea voyage. Some of these causes can be cured, for example, vertigo induced by exhaustion or loss of body fluids (after hemorrhagias), but others such as the injuries of the cerebellum cannot. His general advice is that persons suffering from vertigo and dizziness should avoid strong, sustained body rotations, heavy and warming food, baths, and lengthy sleep under a feather-bed.

Although Romberg's neurological textbook provides detailed descriptions and some causes, most of the specific

**Fig. 1** "Ein Abenteuer in der Neujahrsnacht" ("An adventure on New Year's Eve") by Wilhem Busch [38]. This funny cartoon sequence illustrates positional alcohol vertigo

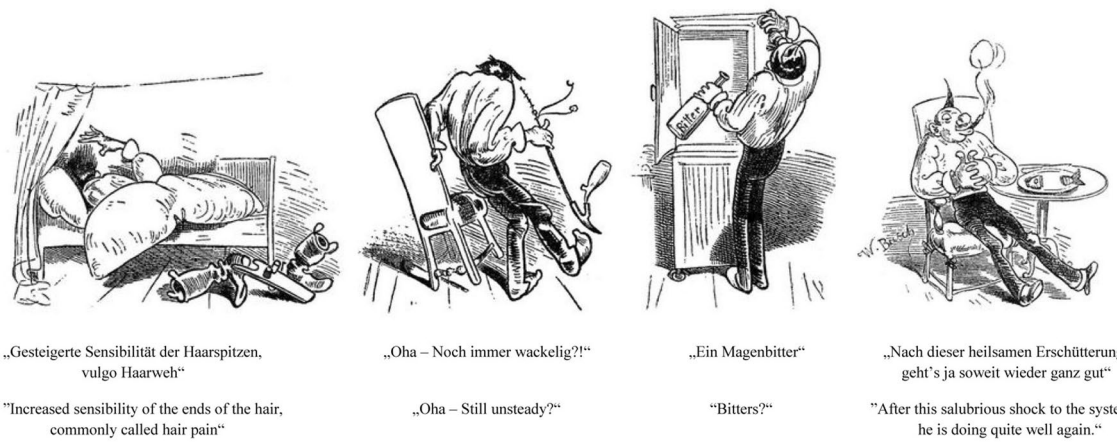


**Fig. 2** "Der Katzenjammer am Neujahrsmorgen" (The hangover on New Year's Day") [38]. Wilhelm Busch illustrates vertigo and unsteadiness the morning after excessive drinking and how a "morning-after drink" has a restabilizing effect

vertigo syndromes known nowadays are missing. Our current knowledge of vestibular function and disorders dates back to a group of scientists who lived in the Nineteenth century: among them, Jan Evangelista Purkinje, Ernst Mach, Josef Breuer, Hermann Helmholtz, and Alexander Crum-Brown. Their seminal work not only revealed the methods of sensing motion, it also laid the basis for modern vestibular and ocular motor research [31]. The Twentieth century witnessed another invaluable source that led to modern eye movement research. *The Moving Tablet of the Eye* [40] contains numerous histories of optics, ophthalmology and eye movements. The most knowledgeable and influential contemporary physician in the study of labyrinthine malfunction would be the otolaryngologist Harold Schuknecht (1917–1992). He presented controversial hypotheses and experimental evidence to explain the three most common forms of labyrinthine vertigo: benign paroxysmal positioning vertigo (first described in 1921 by Bárány), vestibular neuritis (by Ruttin in 1909), and Menière's disease (by Menière in 1861) [32, 41].

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## Compliance with ethical standards

**Conflicts of interest** The authors declare that they have no competing interests.

**Ethical standards** The study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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