

Until Yaakov Avinu's time, death came unexpectedly at the completion of one's predestined number of days (*Baba Metz'ia* 87a) in the form of a sneeze that would expel the person's soul through his nostrils (*Sanhedrin* 107b). Yaakov prayed for a warning preceding his death, which would enable him to conclude his business and spiritual endeavors and part from his family with a final message. G-d answered Yaakov's request at the end of Bereishes, "Now it came to pass after these incidents that [someone] said to Joseph, 'Behold, your father is ill.' So he took his two sons with him, Manasseh and Ephraim" (*Bereishis* 48:1) [1]. News of Yaakov's strange death spread. "All of the peoples of the world heard of this and were amazed, since nothing like this had happened since heaven and earth were created" (*Mishnah Brurah, Orach Chaim, siman* 230, *seif katan* 7) [5]. Yaakov Avinu was the first person in history to die from illness.

The link between sneezing and life originally appears with the creation of man. "And *HaShem* (G-d) formed the man of dust from the ground and He blew into his nostrils the soul of life and man became a living being" (*Bereishis* 2:7). Adam's life came in through the nose. Later in Bereishis, Noach surveys the damage of the flood and describes the scene, "All in whose nostrils was the breath of the spirit of life, of everything that was on dry land, died" (*Bereishis* 7:22) [1]. From this observation Rashi, a medieval Tanach and Talmudi commentator, derives that the final determination of death requires a cessation of breath at the nostrils and not at the heart (*Baba Metz'ia* 87a). This has practical ramifications in *halacha* [10]. Rambam, a twelfth century physician and Torah scholar, states that if one examines a body on Shabbos and cannot detect a breath from the nostrils, that person is considered dead and the body becomes *muktzeh* and may not be moved until after Shabbos [*Mishneh Torah* (Code of Maimonides), *Hilchot Shabbat* (Laws of Sabbath), 2:19]. The Shulchan Aruch, a universally accepted code of Jewish law, says that if a person is covered by debris, his discoverer must dig until he reaches the nose, and proclaim the person dead if he cannot sense breath from the nostrils, regardless of whether he uncovered the head or the feet first (*Orach Chaim* 329:4) [10]. We see that the nose is associated with both life and death. The same way the soul enters through the nostrils to create life, it also departs in a sneeze which brings death.

Across the globe, Jews and non-Jews in every region and nation have the custom to acknowledge a sneeze with distinct sayings that originate from the culture's ancient beliefs. Ilana Angel, a writer for the Jewish Journal, describes her experience on the London train which demonstrates how people almost instinctively respond to a sneeze no matter how distracted. "Everyone ignores

everyone else on the train... and no matter who sneezes, everyone in the vicinity of that person says 'bless you'. It is quite fascinating. It is as if a sneeze snaps them out of their trance long enough to say bless you, then the trance is immediately back on" [2]. No matter where one is in the world, typically indifferent bystanders almost always acknowledge another's sneeze. Some cultures think sneezing is a good omen. In Germany, it is proper to wish "Gesundheit," "to health," in response to a sneeze. According to the old German legends, if a person sneezed three times before breakfast, it meant that he would receive a present. Others believe a sneeze is a sign that the individual is cursed. In India, a minority of people believe sneezing is a sign of bad luck. Those who witness a sneeze exclaim, "live," to which the sneezer responds, "live with you." Some cultures even have a ritual which the sneezer must perform to circumvent a terrible fate. An old Chinese superstition stated that sneezing on New Year's Eve was a portent of future troubles. To avert misfortune, the sneezer needed to obtain and eat a small tortoise-shaped cake from three different families before midnight. Another common response of "God bless you," started as a blessing by Pope Gregory the Great (540-604 BCE) who called for heavenly interference to protect individuals from the Bubonic plague. The phrase was also used to prevent demons from entering a weakened body [3]. Jews wish a sneezer, "to health," since historically the sneeze signified death. In Hebrew, "labriut," in Yiddish "Zai gezunt," and in Aramaic, "asusa," all mean "to health [1]." There may be a basis for the belief that sneezing causes bad luck. Though generally considered to be harmless, sneezes have occasionally led to other more serious conditions including strokes, detachment of the retina, miscarriages, car accidents, and more [8]. It is interesting that these cultures all have unique, long standing traditions to verbally acknowledge a sneeze.

What causes all humans to sneeze? Sneezing, also known as sternutation, is an irrepressible reflex that takes place suddenly. Sneezing is the body's automatic response to irritants in the nose and mouth [8]. The nose plays a crucial role in body protection by purifying inhaled air of dirt and bacteria. These particles become trapped in the mucous membranes of the nasal cavity and are later digested along with the mucous in the stomach, effectively deactivating all potential pathogens. Sometimes, particles entering the nose cause irritation in the mucous membranes. When this happens, the membranes send an afferent signal that travels along the maxillary and ophthalmic pathways of the trigeminal nerve which communicates the discomfort to the brain [12]. Once interpreted at the brain, an efferent signal is sent to the mucous glands and the diaphragm. The mucous glands secrete mucous and the diaphragm contracts, thus producing the sneeze. The sneeze can be

divided into two stages, corresponding to the two parts of the onomatopoeia “ah-choo” [8]. The first stage of the sneeze, which includes the inhalation breath, corresponds to “ah” while the second stage, which features the explosive exhalation and the final relief is represented by “choo.” Without the ability to sneeze, a person has a harder time expelling those pathogens and therefore feels significant discomfort. Lateral medullary syndrome (results from a stroke in the lateral medulla, a region of the brainstem that is believed to contain the sneeze center) has, in some cases, led to difficulty in sneezing. The individual feels an itch and a need to sneeze, but is unable to produce the sneeze and therefore cannot gain relief [4]. Today, scientists have a clear knowledge of the physiology, triggers, and phases of a sneeze.

There is a less understood, genetically determined cause for sneezing. Autosomal Dominant Compelling Helio-Ophthalmic Outburst Syndrome (A.C.H.O.O.), also known as photo-reflexive sneezing or “sun sneezing,” is a genetic condition in which an effected individual sneezes when looking at a bright light. Though the exact gene has not been identified, it is known that the gene is not related to the X or Y chromosome specifically, meaning that there is a fifty percent chance that a child will inherit the gene if either parent has the condition. Approximately 18-35% of Americans are affected by this syndrome [11]. On average, an effected individual sneezes two or three times when looking at a bright light, but it may reach as many as forty sneezes when moving from a dark space to a bright area [7]. The photo-reflexive sneeze is not considered to be dangerous, and as of date, not much research has been conducted on the subject.

The reason behind photo-reflexive sneezing has been hypothesized for two thousand years. Aristotle philosophized that the sneeze is produced due to heat on one’s nose, but this idea was disproven by Francis Bacon who did not sneeze when he stood in direct sunlight with his eyes closed. Bacon thought that sunlight in the eyes stimulates the tear glands. When the moisture seeps into the nose it causes irritation and triggers the sneeze. Scientists today have shown this theory to be impossible since the sneeze occurs too soon after the initial exposure to light to be attributed to moisture traveling down the tear ducts. Neurologists believe the photic sneeze is a reflex controlled by the crossed wires in the brain. A normal sneeze is initiated by the irritation of the trigeminal nerve at the mucous glands in the nose. The photo reflexive sneeze results from a misdirected signal by the optic nerve to the trigeminal nerve. In the presence of a lot of light, the optic nerve sends an electric impulse to the brain which sends a command to the sphincter muscle of the iris to constrict the pupils, thereby decreasing the amount of light that can enter the eye. One theory regarding the origin of photo reflexive sneezing is that some of this electric signal is misdirected and stimulates the trigeminal nerve, bringing about the

sneezes [9]. The little that is known about A.C.H.O.O. creates a foundation for potential research projects; scientists have yet to find the gene and confirm the mechanisms that control the photic sneeze reflex.

Recently, scientists have discussed interest in learning more about sneezing, and hope to apply this knowledge to more serious conditions. Certain types of epileptic seizures are triggered by exposure to bright light and some migraines are caused by photophobia. Louis Ptacek, a neurologist at the University of California in San Francisco and an investigator at the Howard Hughes Medical Institute, studies epilepsy and migraines and focuses on the photo reflexive effect. He believes that if the gene for photo reflexive sneezing were found, then scientists may also be able to better understand these other light sensitive reflexes [9].

Lydia Bourouiba, a mathematician, fluid dynamicist, and head of a research lab at the Massachusetts Institute of Technology in Cambridge, measures the velocities and distances traveled by saliva and mucous expelled by a sneeze using cameras that record thousands of frames per second. This information helps her learn about the way airborne viruses and pathogens spread. Bourouiba hopes that her research can serve as a scientifically proven basis for developing health codes in public areas to prevent contagion. She looks at the sizes of sneeze and cough particles, which tells her how many particles are present, and the most likely trajectory of the particles. With this information, there may be a way to manipulate environmental conditions such as temperature and airflow to reduce the likelihood of contamination. This understanding would also help health practitioners determine which people are more likely to spread disease and which environments are most conducive to airborne contagion [6].

Just as the ability to sneeze is important for one’s physical health, it is also good for one’s religious wellbeing. The Talmud and Midrash state that sneezing is a positive sign in a sick person, signifying diminished severity in the person’s ailment (*Berachos* 57b; *Bereishit Rabbah* 20:10). In *Berachos* (24b) the Talmud states, “If a person sneezes while praying, it is a good sign for him. Just as he is given satisfaction below, so is He given satisfaction Above.” Interestingly the connection between the nose and holiness is even found in the Zohar in which G-d is called “the Master of the nose (*Zohar* 3:130a) [5].” The kabbalists considered scent to be a heavenly sense (*Maamar Zoz’s Chanukas HaMizbe’ach*, in the appendix to *Ohr HaTorah, Bamidbar; tes al*). Spices were burned daily in the Holy Temple, and on the holiest day of the year, Yom Kippur, the high priest entered the Holy of Holies to perform the annual offering involving the incense to please G-d [5]. Some *halachos* of sneezing still apply today. If a person sneezes while eating a meal, the others present should not respond “asusa,” since talking at the

time of a meal may be a choking hazard (*Ta'anis* 5b). It would also be inappropriate to speak about any non-Torah related topic, even to say “bless you,” in a *beis midresh* (a room designated for Torah study) because such conversation distracts from the learning (*Berachos* 53a).

The subject of sneezing has been relevant throughout history and is ever relevant today appearing in religious texts, halacha, medicine, worldwide etiquette, and in current research.

“Ah, Ah, Achoo!”

“Labriut.”

“To health” indeed. The sneeze has been a necessary part of the individual’s immune system since the beginning of man, but continued research may lead to new

health protocols that will increase overall well-being on a larger scale, reaching many more people.

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