

Word (pg.)	Definition/Explanation
Copenhagen (5)	The capital and most populous city of Denmark . Copenhagen is situated on the eastern coast of the island of Zealand ; another small portion of the city is located on Amager ,
German occupation (5)	<p>At the outset of World War II, Denmark declared itself neutral. On 9 April 1940, Germany occupied Denmark in Operation Weserübung and the king and government functioned as normal in a <i>de facto</i> protectorate over the country until 29 August 1943, when Germany placed Denmark under direct military occupation, which lasted until the Allied victory on 5 May 1945. Contrary to the situation in other countries under German occupation, most Danish institutions continued to function relatively normally until 1945. Just over 3,000 Danes died as a direct result of the occupation. Overall this represents a very low mortality rate when compared to other occupied countries and most belligerent countries.</p> <p>An effective resistance movement developed by the end of the war, and most Danish Jews were rescued in 1943 when German authorities ordered their internment as part of the Holocaust.</p>
Uncertainty principle (6)	In quantum mechanics , the uncertainty principle (also known as Heisenberg's uncertainty principle) states that there is a limit to how accurately certain pairs of particle properties can be measured at the same time. Introduced first in 1927, by the German physicist Werner Heisenberg , it states that the more precisely the position of some particle is determined, the less precisely its momentum can be known, and vice versa. Historically, the uncertainty principle has been confused with a somewhat similar effect in physics , called the observer effect , which notes that measurements of certain systems cannot be made without affecting the systems, that is, without changing something in a system.
Tisvilde (6)	A small town located on the north coast of the island Zealand .
Quantum theory (6)	A fundamental theory in physics which describes nature at the smallest scales of energy levels of atoms and subatomic particles . Classical physics , the physics existing before quantum mechanics, describes nature at ordinary (macroscopic) scale, while quantum physics describes nature at the atomic level. These two theories of physics make conflicting assumptions, and have yet to be unified by a single theory. In quantum theory, objects have characteristics of both particles and waves and there are limits to the precision with which quantities can be measured. Heisenberg and others reconceived early quantum theory to create modern quantum theory.
Quantum mechanics (7)	See 'quantum theory (6)'.
Max Born (7)	(11 December 1882 – 5 January 1970) A German physicist and mathematician who was instrumental in the development of quantum mechanics . Born won the 1954 Nobel Prize in Physics for his "fundamental research in quantum mechanics, especially in the statistical interpretation of the wave function ". In 1925, Born and Werner Heisenberg formulated the matrix mechanics representation of quantum

	mechanics. In January 1933, the Nazi Party came to power in Germany, and Born, who was Jewish, was suspended. He emigrated to the United Kingdom.
Göttingen (7)	A university city in Lower Saxony, Germany . It is the capital of the district of Göttingen . Göttingen has been called "the city of science". From 1921 to 1933, the physics theory group at the University of Göttingen was led by Max Born . In the 1930s, the university became a focal point for the Nazi crackdown on "Jewish physics", as represented by the work of Albert Einstein . This was later called the " great purge " of 1933.
Complementarity (7)	Both a theoretical and an experimental result ^{[1][2][3]} of quantum mechanics , this holds that objects have certain pairs of complementary properties which cannot all be observed or measured simultaneously. The complementarity principle was formulated by Niels Bohr . Examples of complementary properties that Bohr considered: <ul style="list-style-type: none"> • Position and momentum • Energy and duration • Spin on different axes • Wave and particle-related properties • Value of a field and its change (at a certain position) • Entanglement and coherence
Carl von Weizsäcker (8)	Carl Friedrich Freiherr von Weizsäcker (28 June 1912 – 28 April 2007) was a German physicist and philosopher . He was the longest-living member of the team which performed nuclear research in Germany during the Second World War , under Werner Heisenberg 's leadership. Weizsäcker made important theoretical discoveries regarding energy production in stars from nuclear fusion processes.
Wehrmacht (8)	German for "defence force". It was the unified armed forces of Nazi Germany from 1935 to 1946. It consisted of the Heer (army), the Kriegsmarine (navy) and the Luftwaffe (air force). It was the manifestation of Nazi Germany's efforts to rearm the nation to a greater extent than the Treaty of Versailles permitted. After the Nazi seizure of power in 1933, one of Adolf Hitler 's most overt and audacious moves was to establish the <i>Wehrmacht</i> . Fulfilling the Nazi regime's long-term goals of regaining lost territory as well as gaining new territory and dominating its neighbours required the reinstatement of conscription and massive investment and spending on the armaments industry. In December 1941, Hitler designated himself as commander-in-chief of the <i>Wehrmacht</i> . The <i>Wehrmacht</i> formed the heart of Germany's politico-military power. Closely cooperating with the SS (especially on the Eastern Front), the German armed forces committed numerous war crimes and atrocities , despite later denials.
SS (8)	The <i>Schutzstaffel</i> (literally "Protection Squadron") was a major paramilitary organization under Adolf Hitler and the Nazi Party (NSDAP) in Nazi Germany , and later throughout German-occupied Europe during World War II . It began with a small guard unit known as the <i>Saal-Schutz</i> ("Hall Security"). From 1929 until the regime's collapse in 1945, the SS was the foremost agency of security, surveillance, and terror within Germany and German-occupied Europe. The two main constituent groups were the Allgemeine SS (General SS) and Waffen-SS (Armed SS). The <i>Allgemeine</i>

	<p>SS was responsible for enforcing the racial policy of Nazi Germany and general policing, whereas the Waffen-SS consisted of combat units within Nazi Germany's military. A third component of the SS, the SS-Totenkopfverbände (SS-TV), ran the concentration camps and extermination camps. Additional subdivisions of the SS included the Gestapo and the Sicherheitsdienst (SD) organizations. They were tasked with the detection of actual or potential enemies of the Nazi state, the neutralization of any opposition, policing the German people for their commitment to Nazi ideology, and providing domestic and foreign intelligence.</p>
German Cultural Institute (8)	<p>The German Academy (<i>die Deutsche Akademie</i>, pronounced [diː dɔʏtʃə ʔakadeˈmiː]) is the short name of the Academy for the Scholarly Research and Fostering of Germandom (<i>die Akademie zur Wissenschaftlichen Erforschung und Pflege des Deutschtums</i>), a German cultural institute founded in 1925 at Munich, under the Weimar Republic. After 1933 it, like virtually all public institutions in Germany, became heavily tainted with Nazi ideology. In 1951, the German Federal Republic replaced the Deutsche Akademie with the present Goethe-Institut.</p>
John the Baptist (8)	<p>a Jewish itinerant preacher in the early first century AD. John is revered as a major religious figure in Christianity, Islam, the Bahá'í Faith, and Mandaism. He is called a prophet by all of these traditions, and is honored as a saint in many Christian traditions.</p> <p>John used baptism as the central symbol or sacrament of his messianic movement. Most scholars agree that John baptized Jesus. Some scholars believe Jesus was a follower or disciple of John. Christians commonly refer to John as the precursor or forerunner of Jesus, since John announces Jesus' coming.</p>
Institute for Theoretical Physics (8)	<p>The Niels Bohr Institute (Danish: <i>Niels Bohr Institutet</i>) is a research institute of the University of Copenhagen. The Institute was founded in 1921, as the Institute for Theoretical Physics of the University of Copenhagen, by the Danish theoretical physicist Niels Bohr, who had been on the staff of the University of Copenhagen since 1914, and who had been lobbying for its creation since his appointment as professor in 1916. During the 1920s, and 1930s, the Institute was the center of the developing disciplines of atomic physics and quantum physics. Physicists from across Europe (and sometimes further abroad) often visited the Institute to confer with Bohr on new theories and discoveries. The Copenhagen interpretation of quantum mechanics is named after work done at the Institute during this time.</p>
Rozental (8)	<p>Stefan Rozental (13 August 1903, Łódź – 2 August 1994, Copenhagen), was a nuclear physicist, specialising in quantum mechanics. He held an assistant position with Werner Heisenberg in Leipzig between 1929 and 1934 and lectured in Kraków between 1934 and 1938. Due to the rising Antisemitism in Poland he emigrated to Denmark and arrived in Copenhagen in March 1938 where Niels Bohr admitted him to his institute. He was Niels Bohr's personal assistant for almost fifteen years, whom he assisted even into the early sixties after both returned to Copenhagen in 1945.</p>
Petersen (8)	<p>Aage Petersen (1927) was a Danish physicist who specializes in quantum mechanics. He received his education at the University of Copenhagen. From 1952 to 1962 he was assistant to Niels Bohr.</p>

Christian Møller (8)	Christian Møller (22 December 1904 in Hundslev, Als – 14 January 1980 in Ordrup) was a Danish chemist and physicist who made fundamental contributions to the theory of relativity , theory of gravitation and quantum chemistry .
Occupation of Poland (9)	The occupation of Poland by Nazi Germany and the Soviet Union during the Second World War (1939–1945) began with the German-Soviet invasion of Poland in September 1939, and it was formally concluded with the defeat of Germany by the Allies in May 1945. Throughout the entire course of the foreign occupation, the territory of Poland was divided between Germany and the Soviet Union (USSR) with the intention of eradicating Polish culture and subjugating its people by occupying German and Soviet powers. ^[1] In summer-autumn of 1941 the lands annexed by the Soviets were overrun by Germany in the course of the initially successful German attack on the USSR . Both occupying powers were equally hostile to the existence of sovereign Poland , Polish people , and the Polish culture aiming at their destruction. About 6 million Polish citizens—nearly 21.4% of Poland's population—died between 1939 and 1945 as a result of the occupation , ^{[4][5][6]} half of whom were Polish Jews .
Moscow (9)	The capital and most populous city of Russia and formerly the USSR. Moscow is considered the centre of Russian culture.
Gestapo (9)	The <i>Geheime Staatspolizei</i> (Secret State Police), ^{[2][3]} was the official secret police of Nazi Germany and German-occupied Europe . The force was created by Hermann Göring in 1933 by combining the various security police agencies of Prussia into one organisation. During World War II , the Gestapo played a key role in the Nazi plan to exterminate the Jews of Europe.
Goudsmit (9)	Samuel Abraham Goudsmit (July 11, 1902 – December 4, 1978) was a Dutch-American physicist famous for jointly proposing the concept of electron spin with George Eugene Uhlenbeck in 1925.
Prinz-Albrecht-Strasse (9)	Niederkirchnerstraße a street in Berlin, Germany . The thoroughfare was known as Prinz-Albrecht-Straße until 1951 but the name was changed by the post-war German government due to its connotation with Nazi Germany . The street was the location of the SS Reich Main Security Office . From May 1933 this building served as the headquarters of the Gestapo created by the order of Hermann Göring , where many political prisoners were tortured and executed.
The Party (9)	The National Socialist German Workers' Party (German: <i>Nationalsozialistische Deutsche Arbeiterpartei</i> abbreviated NSDAP), commonly referred to in English as the Nazi Party was a far-right political party in Germany that was active between 1920 and 1945. The Nazi Party emerged from the German nationalist , racist and populist <i>Freikorps</i> paramilitary culture, which fought against the communist uprisings in post- World War I Germany. Initially, Nazi political strategy focused on anti-big business , anti-bourgeois and anti-capitalist rhetoric, although such aspects were later downplayed in order to gain the support of industrial entities and in the 1930s the party's focus shifted to anti-Semitic and anti-Marxist themes. Their aim was to unite "racially desirable" Germans as national comrades, while excluding those deemed

	<p>either to be political dissidents, physically or intellectually inferior, or of a foreign race.</p> <p>The Nazis sought to improve the stock of the Germanic people through racial purity and eugenics, broad social welfare programs and a collective subordination of individual rights, which could be sacrificed for the good of the state and the "Aryan master race". To maintain the supposed purity and strength of the Aryan race, the Nazis sought to exterminate Jews, Romani and Poles along with the vast majority of other Slavs and the physically and mentally handicapped. They imposed exclusionary segregation on homosexuals, Africans, Jehovah's Witnesses and political opponents.</p> <p>The persecution reached its climax when the party-controlled German state organized the systematic genocidal killing of an estimated 5.5 to 6 million Jews and millions of other targeted victims, in what has become known as the Holocaust. The party's leader since 1921, Adolf Hitler, was appointed Chancellor of Germany by President Paul von Hindenburg on 30 January 1933. Hitler rapidly established totalitarian regime known as the Third Reich. Following the defeat of the Third Reich at the conclusion of World War II in Europe, the party was "declared to be illegal" by the Allied powers, who carried out denazification in the years after the war.</p>
Foreign Office (9)	<p>The <i>Auswärtiges Amt</i>, or Foreign Office, consisted of an elite group of men. These were Nazi Germany's diplomats. All of the senior diplomats in the 1930s were veterans of the struggle to win Germany "world power status" in the first years of the 20th century. Hitler's goal of making Germany into the world's greatest power was thus a foreign policy goal that the diplomats embraced quite headily. Officially, the men of the <i>Auswärtiges Amt</i> were supposed to be non-political, but in practice the diplomats formed a "quite exclusive group" with extremely conservative views and values. For these men, unconditional loyalty to the state was the highest possible value, and though the majority of the diplomats were not ideological National Socialists, they served the Nazi regime loyally until the very end.</p> <p>There was an office within the Nazi Party, the NSDAP Office of Foreign Affairs (German: <i>Außenpolitisches Amt der NSDAP</i>, A.P.A. or APA), which carried out similar functions, and was directly tied to politics. Many diplomats in the Foreign Office were also members of the NSDAP.</p>
Leipzig (9)	In Leipzig in the Free State of Saxony , Germany , Leipzig University is one of the world's oldest universities (founded 1409) and the second-oldest university (by consecutive years of existence) in Germany.
Munich (9)	Ludwig Maximilian University of Munich is Germany's sixth-oldest university in continuous operation (established in 1472). The University of Munich has, particularly since the 19th century, been considered as one of Germany's as well as one of Europe's most prestigious universities.
Columbia (9)	A private Ivy League research university in Upper Manhattan , New York City . Established in 1754, Columbia is the oldest institution of higher education in New York and the fifth-oldest institution of higher learning in the United

	States. Columbia is one of the fourteen founding members of the Association of American Universities and was the first school in the United States to grant the M.D. degree . The university administers the Pulitzer Prize annually.
Chicago (9)	A private, non-profit research university in Chicago, Illinois . Chicago's physics department and the Met Lab helped develop the world's first man-made, self-sustaining nuclear reaction(Chicago Pile-1) beneath the viewing stands of university's Stagg Field , a key part of the classified Manhattan Project effort of World War II.
Ny-Carlsberg (11)	Carlsberg is an area located straddling the border of Valby and Vesterbro districts in central Copenhagen, Denmark approximately 2.4 km from the City Hall Square . The area is dominated by numerous historic and restored 19th- and early 20th-century buildings, many of which have lavish ornamentations, as well as two historic gardens. Ny-Carlsberg translates to New Carlsberg in English. I cannot find any evidence of a neighborhood or area in Copenhagen with this specific name.
Theoretical physics (11)	A branch of physics that employs mathematical models and abstractions of physical objects and systems to rationalize, explain and predict natural phenomena . This is in contrast to experimental physics , which uses experimental tools to probe these phenomena.
Fission (11)	Nuclear fission is a process used to create energy. It is when an atom splits apart into smaller atoms. The process gives off a lot of energy, and is used in nuclear weapons and nuclear reactors . Nuclear fission was discovered in December 1938 by the German nuclear chemist Otto Hahn and his assistant Fritz Strassmann in Berlin . If a (relatively) very large nucleus is hit by a slow-moving neutron, it will sometimes become unstable and break into two nuclei. When the nucleus breaks apart (or fissions) it releases a lot of energy and it also causes some neutrons to be released from the nucleus. For a few isotopes (an atom with the same amount of protons as its element, but with a different amount of neutrons) such fission can release many neutrons. If those neutrons then hit other atoms, they will make the other atoms split. This can happen again and again. This is called a nuclear chain-reaction , and it can release huge amounts of energy very quickly. In a nuclear bomb , this must happen very quickly to make a very big explosion. In a nuclear reactor this must happen slowly to make heat. The heat is used to boil water into steam, which turns a steam turbine to generate electricity.
Nucleus (11)	The nucleus is the center of an atom . It is made up of nucleons called (protons and neutrons) and is surrounded by the electron cloud . Although it is only a very small part of the atom, the nucleus has most of the mass . Almost all of the mass in an atom is made up from the protons and neutrons in the nucleus with a very small contribution from the orbiting electrons . Neutrons have no charge and protons are positively charged. Because the nucleus is only made up of protons and neutrons it is positively charged. Things that have the same charge repel each other: this repulsion is part of what is called electromagnetic force . Unless there was something else holding the nucleus together it could not exist because the protons would push away from each other. The nucleus is actually held together by another force known as the strong nuclear force .

Einstein (11)	<p>(14 March 1879 – 18 April 1955) A German-born theoretical physicist who developed the theory of relativity, one of the two pillars of modern physics (alongside quantum mechanics). His work is also known for its influence on the philosophy of science. He is best known to the general public for his mass–energy equivalence formula $E = mc^2$, which has been dubbed "the world's most famous equation". He received the 1921 Nobel Prize in Physics "for his services to theoretical physics, and especially for his discovery of the law of the photoelectric effect", a pivotal step in the development of quantum theory.</p> <p>In 1933, while Einstein was visiting the United States, Adolf Hitler came to power. Because of his Jewish background, Einstein did not return to Germany. He settled in the United States and became an American citizen in 1940. On the eve of World War II, he endorsed a letter to President Franklin D. Roosevelt alerting him to the potential development of "extremely powerful bombs of a new type" and recommending that the US begin similar research. This eventually led to the Manhattan Project. Einstein supported the Allies, but he generally denounced the idea of using nuclear fission as a weapon. In 1933, while Einstein was visiting the United States, Adolf Hitler came to power.</p> <p>Because of his Jewish background, Einstein did not return to Germany. He settled in the United States and became an American citizen in 1940. On the eve of World War II, he endorsed a letter to President Franklin D. Roosevelt alerting him to the potential development of "extremely powerful bombs of a new type" and recommending that the US begin similar research. This eventually led to the Manhattan Project. Einstein supported the Allies, but he generally denounced the idea of using nuclear fission as a weapon.</p>
Wolfgang Pauli (11)	<p>(25 April 1900 – 15 December 1958) An Austrian-born Swiss and American theoretical physicist and one of the pioneers of quantum physics. In 1945, after having been nominated by Albert Einstein, Pauli received the Nobel Prize in Physics for his "decisive contribution through his discovery of a new law of Nature, the exclusion principle or Pauli principle". The discovery involved spin theory, which is the basis of a theory of the structure of matter.</p>
Otto Frisch (11)	<p>(1 October 1904 – 22 September 1979) An Austrian physicist who worked on nuclear physics. With Lise Meitner he advanced the first theoretical explanation of nuclear fission (coining the term) and first experimentally detected the fission by-products. Later, with his collaborator Rudolf Peierls^[1] he designed the first theoretical mechanism for the detonation of an atomic bomb in 1940.</p>
Lise Meitner (11)	<p>(7 November 1878 – 27 October 1968) An Austrian-Swedish physicist who worked on radioactivity and nuclear physics. She was one of the people who led the small group of scientists who first discovered nuclear fission of uranium when it absorbed an extra neutron. Ahe was a physics professor and a department head at the Kaiser Wilhelm Institute; she was the first woman to become a full professor of physics in Germany. She lost these positions in the 1930s because of the anti-Jewish Nuremberg Laws of Nazi Germany, and in 1938 she fled to Sweden.</p>

Sommerfeld (11)	Arnold Johannes Wilhelm Sommerfeld (5 December 1868 – 26 April 1951) A German theoretical physicist who pioneered developments in atomic and quantum physics , and also educated and mentored a large number of students for the new era of theoretical physics. He served as doctoral supervisor for many Nobel Prize winners in physics and chemistry. He introduced the 2nd quantum number (azimuthal quantum number) and the 4th quantum number (spin quantum number). He also introduced the fine-structure constant and pioneered X-ray wave theory.
Von Laue (11)	Max Theodor Felix von Laue (9 October 1879 – 24 April 1960) was a German physicist who won the Nobel Prize in Physics in 1914 for his discovery of the diffraction of X-rays by crystals. In addition to his scientific endeavors with contributions in optics , crystallography , quantum theory , superconductivity , and the theory of relativity , he had a number of administrative positions which advanced and guided German scientific research and development during four decades. A strong objector to National Socialism (Nazism), he was instrumental in re-establishing and organizing German science after World War II .
Wirtz (11)	Karl Eugen Julius Wirtz (24 April 1910 – 12 February 1994) was a German nuclear physicist , born in Cologne . He was arrested by the allied British and American Armed Forces and incarcerated at Farm Hall for six months in 1945 under Operation Epsilon .
Harteck (11)	Paul Karl Maria Harteck (20 July 1902 – 22 January 1985) was a German physical chemist . In 1945 under Operation Epsilon in "the big sweep" throughout Germany, Harteck was arrested by the allied British and American Armed Forces for suspicion of aiding the Nazis in their nuclear weapons program and he was incarcerated at Farm Hall, an English house fitted with covert electronic listening devices , for six months.
Otto Hahn (12)	(8 March 1879 – 28 July 1968) A German chemist and pioneer in the fields of radioactivity and radiochemistry . He is referred to as the father of nuclear chemistry . He was awarded the Nobel Prize in Chemistry in 1944 for the discovery and the radiochemical proof of nuclear fission . Considered by many to be a model for scholarly excellence and personal integrity, he became one of the most influential and respected citizens of the new postwar country West Germany . Hahn was an opponent of national socialism (Nazism) and Jewish persecution by the Nazi Party . Albert Einstein wrote that Hahn was "one of the very few who stood upright and did the best he could in these years of evil". After World War II , Hahn became a passionate campaigner against the use of nuclear energy as a weapon .
Enrico Fermi (12)	(29 September 1901 – 28 November 1954) An Italian and naturalized-American physicist and the creator of the world's first nuclear reactor , the Chicago Pile-1 . He has been called the "architect of the nuclear age " and the "architect of the atomic bomb". He was one of the very few physicists in history to excel both theoretically and experimentally . Fermi held several patents related to the use of nuclear power, and was awarded the 1938 Nobel Prize in Physics for his work on induced radioactivity by neutron bombardment and the discovery of transuranic elements . He made significant contributions to the development of quantum theory , nuclear and particle physics , and statistical mechanics . Fermi left Italy in 1938 to escape new Italian Racial

	<p>Laws that affected his Jewish wife Laura Capon. He emigrated to the United States where he worked on the Manhattan Project during World War II. Fermi led the team that designed and built Chicago Pile-1, which went critical on 2 December 1942, demonstrating the first artificial self-sustaining nuclear chain reaction.</p>
John Wheeler (12)	<p>John Archibald Wheeler (July 9, 1911 – April 13, 2008) was an American theoretical physicist. He was largely responsible for reviving interest in general relativity in the United States after World War II. Wheeler also worked with Niels Bohr in explaining the basic principles behind nuclear fission. He is best known for linking the term "black hole" to objects with gravitational collapse already predicted early in the 20th century, for coining the terms "quantum foam", "neutron moderator", "wormhole" and "it from bit", and for hypothesizing the "one-electron universe". In 1939 he teamed up with Bohr to write a series of papers using the liquid drop model to explain the mechanism of fission. During World War II, he worked with the Manhattan Project's Metallurgical Laboratory in Chicago, where he helped design nuclear reactors, and then at the Hanford Site in Richland, Washington, where he helped DuPont build them.</p>
1938 Congress in Warsaw (13)	<p>The head of theoretical physics at the University of Warsaw, Czesław Białobrzęski, organized the „New Theories in Physics” conference of 1938, which is famous for its role in the development of quantum physics.</p>
Zürich in September 1939 (13)	<p>The International Solvay Institutes for Physics and Chemistry, located in Brussels, were founded by the Belgian industrialist Ernest Solvay in 1912. Following the initial success of 1911, the Solvay Conferences (<i>Conseils Solvay</i>) have been devoted to outstanding preeminent open problems in both physics and chemistry. There would usually have been a Conference in 1939, but it was not held due to the outbreak of WWII.</p>
Race laws (14)	<p>The racial policy of Nazi Germany was a set of policies and laws implemented in Nazi Germany (1933–45) based on a specific racist doctrine asserting the superiority of the Aryan race, which claimed scientific legitimacy. This was combined with a eugenics programme that aimed for racial hygiene by compulsory sterilization and extermination of those who they saw as Untermenschen ("sub-humans"), which culminated in the Holocaust. Nazi policies labeled centuries-long residents in German territory who were not ethnic Germans such as Jews (understood in Nazi racial theory as a "Semitic" people of Levantine origins), Romanis (also known as Gypsies, an "Indo-Aryan" people of Indian Subcontinent origins), along with the vast majority of Slavs (mainly ethnic Poles, Serbs, Russians etc.), and most non-Europeans as inferior non-Aryan subhumans (i.e. non-Nordics, under the Nazi appropriation of the term "Aryan") in a racial hierarchy that placed the <i>Herrenvolk</i> ("master race") of the Volksgemeinschaft ("people's community") at the top</p> <p>The Nuremberg Laws (German: <i>Nürnberger Gesetze</i>) were antisemitic and racial laws in Nazi Germany. They were enacted by the Reichstag on 15 September 1935, at a special meeting convened during the annual Nuremberg Rally of the Nazi Party (NSDAP). The two laws were the Law for the Protection of German Blood and German Honour, which forbade</p>

	<p>marriages and extramarital intercourse between Jews and Germans and the employment of German females under 45 in Jewish households; and the Reich Citizenship Law, which declared that only those of German or related blood were eligible to be Reich citizens; the remainder were classed as state subjects, without citizenship rights. A supplementary decree outlining the definition of who was Jewish was passed on 14 November, and the Reich Citizenship Law officially came into force on that date. The laws were expanded on 26 November 1935 to include Romani people. This supplementary decree defined Romanis as "enemies of the race-based state", the same category as Jews.</p>
“The Sound is...? Mined” (14)	<p>Refers to mines (explosive weapons hidden in the water, meant to damage or sink enemy ships) in the Øresund or Öresund (Danish: Øresund) commonly known in English as the Sound. This is a strait which forms the Danish–Swedish border, separating Zealand (Denmark) from Scania (Sweden).</p>
Bayrischzell (15)	<p>A municipality in the district of Miesbach in Bavaria in Germany.</p>
Yellow star (15)	<p>Badges that Jews were ordered to wear in public during certain periods by the ruling Christians and Muslims. The badges served to mark the wearer as a religious outsider, and often served as a badge of shame. After the German invasion of Poland in 1939 there were initially different local decrees requiring Jews to wear a distinctive sign under the General Government. The sign was a white armband with a blue Star of David on it; in the Warthegau a yellow badge in the form of a Star of David on the left side of the breast and on the back. The requirement to wear the Star of David with the word <i>Jude</i> (German for Jew) – inscribed in letters meant to resemble Hebrew writing – was then extended to all Jews over the age of six in the Reich and the Protectorate of Bohemia and Moravia (by a decree issued on September 1, 1941, signed by Reinhard Heydrich) and was gradually introduced in other German-occupied areas, where local words were used.</p>
Christian (15)	<p>Christian Bohr (1916-1934) The eldest son of Niels and Margrethe Bohr, Christian was named for his paternal grandfather. The younger Christian Bohr drowned when an unexpected storm blew into the Kattegat, where he, his father, and some friends were sailing. His brothers were Hans, Erik, Aage, Ernst, and Harald.</p>
The Physical Review (16)	<p>An American peer-reviewed scientific journal established in 1893 by Edward Nichols. It publishes original research as well as scientific and literature reviews on all aspects of physics.</p>
“The velocity-range relations of fission fragments” (16)	<p>The rate of velocity loss (deceleration) by fission fragments (a large nucleus like that of uranium fissions by splitting into two smaller nuclei, along with a few neutrons, the release of heat energy, and gamma rays. The two smaller nuclei are the <i>fission products</i>.) after nuclear fission.</p>
Nuclei (16)	<p>Plural for nucleus – See ‘Nucleus (11)’.</p>
Deuterons (16)	<p>The nucleus of a deuterium atom, consisting of a proton and a neutron. Deuterium is an isotope of hydrogen. Two deuterium atoms combined with an oxygen atom is sometimes called "heavy water." This is because it is like water (H₂O), but heavier because deuterium has one more neutron in its nucleus. Heavy water is sometimes used in nuclear reactors. It is a more efficient neutron moderator than regular water, allowing the use of</p>

	unenriched uranium as fuel. Pure heavy water is not radioactive , but heavy water that has been through a nuclear reactor is slightly radioactive.
Cyclotron (16)	A type of particle accelerator invented by Ernest Lawrence from the University of California, Berkeley in 1930. ^[1] It accelerates charged particles by whirling them in a circle. The first cyclotrons were the size of a hand. Some modern circular accelerators use a circle as wide as a city. Cyclotrons use perpendicular magnetic field to bend electrons and particles through into a semicircular path by an applied electric field . The applied electric field accelerates electrons between the "D" electrodes (also called "dees") of the magnetic field region. The accelerating electric field reverses just at the time the electrons finish their half circle, so that it accelerates them across the gap. With a higher speed, they move in a larger semicircle. After repeating this process several times, they come out the exit port at a high speed. For several decades, cyclotrons were the best source of high-energy beams for nuclear physics experiments; several cyclotrons are still in use for this type of research. The results enable the calculation of various properties, such as the mean spacing between atoms and the creation of various collision products. Subsequent chemical and particle analysis of the target material may give insight into nuclear transmutation of the elements used in the target.
Schrödinger (16)	Erwin Rudolf Josef Alexander Schrödinger (12 August 1887 – 4 January 1961), sometimes written as Erwin Schrodinger or Erwin Schroedinger , was a Nobel Prize-winning Austrian physicist who developed a number of fundamental results in the field of quantum theory , which formed the basis of wave mechanics. He formulated the wave equation (stationary and time-dependent Schrödinger equation). He also wrote on philosophy and theoretical biology. He is also known for his " Schrödinger's cat " thought-experiment.
Experimental physics (17)	The category of disciplines and sub-disciplines in the field of physics that are concerned with the observation of physical phenomena and experiments .
Chadwick (17)	Sir James Chadwick (20 October 1891 – 24 July 1974) was a British physicist who was awarded the 1935 Nobel Prize in Physics for his discovery of the neutron in 1932. In 1941, he wrote the final draft of the MAUD Report , which inspired the U.S. government to begin serious atomic bomb research efforts. He was the head of the British team that worked on the Manhattan Project during the Second World War.
Robert Oppenheimer (17)	Julius Robert Oppenheimer (April 22, 1904 – February 18, 1967) was an American theoretical physicist and professor of physics at the University of California, Berkeley . Oppenheimer was the wartime head of the Los Alamos Laboratory and is among those who are credited with being the "father of the atomic bomb" for their role in the Manhattan Project , the World War II undertaking that developed the first nuclear weapons used in the atomic bombings of Hiroshima and Nagasaki . The first atomic bomb was detonated on July 16, 1945, in the Trinity test in New Mexico ; Oppenheimer later remarked that it brought to mind words from the Bhagavad Gita : "Now I am become Death, the destroyer of worlds."
"set-to with him in Chicago in 1939" (17)	A set-to is an argument. I could not find an account of this specific incident in my research.

Mesons (17)	Mesons are incredibly small subatomic particles that are made of one quark and one antiquark . Antiquarks are the antimatter counterpart of a regular quark, meaning that in a fraction of a second, a quark and its antiquark will destroy each other to produce only energy. Since antimatter quarks have the opposite spin of regular quarks, their spins can cancel each other out, which forms a particle similar to a Higgs Boson . The name meson comes from Greek "mesos", meaning middle. This is because the masses of the first mesons discovered were between the mass of light particles like electrons , called leptons , and heavy particles like protons , called baryons .
Cultural Division of the Foreign Office (18)	See 'Foreign Office (9)'.
German foreign service (18)	See ' Foreign Office (9)'.
Plenipotentiary (18)	A person, especially a diplomat, invested with the full power of independent action on behalf of their government, typically in a foreign country.
"A lecture festival held in your honor" (Göttingen 1922) (18)	Niels Bohr presented a series of lectures on quantum theory and atomic structure – the "Bohr Festival" on 12-22 June 1922 in Göttingen. There Heisenberg met the leading representatives of atomic physics in Germany and Europe. Here, Heisenberg caught the attention of Bohr and Max Born, the latter of whom would invite Heisenberg back to Göttingen as his personal assistant in November 1922.
Slalom (21)	A ski race down a winding course marked by flags or poles.
Uncertainty relationship (22)	See 'uncertainty principle (6)'.
Double-slit experiment (22)	<p>An experiment devised by physicist Thomas Young. It shows that light has both a wavenature or characteristic and a particle nature or characteristic, and that these natures are inseparable. So light is said to have wave-particle duality rather than be only a wave or only a particle. The same is true of electrons and other quantum particles. Thomas Young's experiment with light was part of classical physics well before quantum mechanics, and the concept of wave-particle duality.</p> <p>In the basic version of this experiment, a coherent light source, such as a laser beam, illuminates a plate pierced by two parallel slits, and the light passing through the slits is observed on a screen behind the plate. The wave nature of light causes the light waves passing through the two slits to interfere, producing bright and dark bands on the screen — a result that would not be expected if light consisted of classical particles. However, the light is always found to be absorbed at the screen at discrete points, as individual particles (not waves), the interference pattern appearing via the varying density of these particle hits on the screen. Furthermore, versions of the experiment that include detectors at the slits find that each detected photon passes through one slit (as would a classical particle), and not through both slits (as would a wave). However, such experiments demonstrate that particles do not form the interference pattern if one detects which slit they pass through. These results demonstrate the principle of wave-particle duality.</p>

	<p>The double-slit experiment (and its variations) has become a classic thought experiment, for its clarity in expressing the central puzzles of quantum mechanics. Because it demonstrates the fundamental limitation of the ability of the observer to predict experimental results, Richard Feynman called it "a phenomenon which is impossible [...] to explain in any classical way, and which has in it the heart of quantum mechanics. In reality, it contains the only mystery [of quantum mechanics]."</p>
<p>Schrödinger's cat (22)</p>	<p>Schrödinger's cat is a thought experiment, sometimes described as a paradox, devised by Austrian physicist Erwin Schrödinger in 1935. It illustrates what he saw as the problem of the Copenhagen interpretation of quantum mechanics applied to everyday objects. The scenario presents a cat that may be simultaneously both alive and dead, a state known as a quantum superposition, as a result of being linked to a random subatomic event that may or may not occur. The thought experiment is also often featured in theoretical discussions of the interpretations of quantum mechanics. Schrödinger coined the term <i>Verschränkung</i> (entanglement) in the course of developing the thought experiment.</p> <p>In simple terms, Schrödinger stated that if you place a cat and something that could kill the cat (a radioactive atom) in a box and sealed it, you would not know if the cat was dead or alive until you opened the box, so that until the box was opened, the cat was (in a sense) <i>both</i> "dead and alive". This is used to represent how scientific theory works. No one knows if any scientific theory is right or wrong until said theory can be tested and proved. The cat is both alive and dead until it can be observed (the box opened) which itself interferes with the experiment.</p> <p>The Copenhagen interpretation is used to explain what is happening to the smallest part of an atom (a sub atomic particle) without looking at it (observing it or measuring it). Mathematics are used to show how likely something is to happen to the particle. A particle could be described as being 50% likely to be in one place at one time, or 50% likely to be in one place at another time. This could also be expressed as a chart (or wave form). This is very convenient when making quantum physics calculations.</p> <p>However the only way to be 100% sure of where a particle is, is to observe it. Up until the point that you observe it, the Copenhagen Interpretation says that the particle is there and is not there. It is only when you observe the particle that you know if it's there or not there.</p> <p>While this makes sense in quantum physics, it does not make sense in classical (real world) physics. Schrödinger wanted to show that this way of thinking about quantum mechanics would lead to absurd situations. He designed a thought experiment.</p>
<p>Hendrik Casimir (23)</p>	<p>(July 15, 1909 – May 4, 2000) A Dutch physicist best known for his research on the two-fluid model of superconductors (together with C. J. Gorter) in 1934 and the Casimir effect (together with D. Polder) in 1948.</p>

George Gamow (23)	<p>George Gamow (March 4, 1904 – August 19, 1968), born Georgiy Antonovich Gamov, was a Soviet-American theoretical physicist and cosmologist. He was an early advocate and developer of Lemaître's Big Bang theory. He discovered a theoretical explanation of alpha decay via quantum tunneling, and worked on radioactive decay of the atomic nucleus, star formation, stellar nucleosynthesis and Big Bang nucleosynthesis (which he collectively called nucleocosmogenesis), and molecular genetics. In his middle and late career, Gamow directed much of his attention to teaching and wrote popular books on science.</p>
“problems with the nitrogen nucleus” (23)	<p>Throughout the 1920s, physicists assumed that the atomic nucleus was composed of protons and "nuclear electrons". Under this hypothesis, the nitrogen-14 (^{14}N) nucleus would be composed of 14 protons and 7 electrons, so that it would have a net charge of +7 elementary charge units and a mass of 14 atomic mass units. Obvious problems with the hypothesis became apparent, however. Ralph Kronig pointed out in 1926 that the observed hyperfine structure of atomic spectra was inconsistent with the proton–electron hypothesis. Furthermore, because protons and electrons were assumed to constitute nuclei, nitrogen-14 had the wrong statistics. Thus physicists suggested that nuclear electrons may not obey quantum theory (Dirac's equation included) because their spins would be suppressed, among other reasons.</p>
Klein (24)	<p>Oskar Benjamin Klein (15 September 1894 – 5 February 1977) was a Swedish theoretical physicist. From 1917, he worked a few years with Niels Bohr in the University of Copenhagen.</p>
Harald (25)	<p>Harald Bohr (1928-c. 1938) The youngest of the sons of Margrethe and Niels Bohr. Harald was named for his uncle, Niels' younger brother. The younger died from childhood meningitis. His brothers were Christian, Hans, Erik, Aage, and Ernst.</p>
Tiller (25)	<p>In watercraft, the tiller is attached to a rudder post that provides leverage in the form of torque to turn the rudder.</p>
Cap pistol (25)	<p>A toy gun that creates a loud sound simulating a gunshot and a puff of smoke when a small percussion cap is exploded. Cap guns were originally made of cast iron, but after World War II were made of zinc alloy, and most newer models are made of plastic.</p>
Zealand (26)	<p>The largest and most populous island in Denmark proper. Copenhagen, the capital of Denmark, is located partly on the eastern shore of Zealand and partly on the island of Amager. Despite their identical names, the island is not connected historically to the Pacific nation of New Zealand, which is named after the Dutch province of Zeeland.</p>



Elsinore (26)	<p>Helsingør, classically known in English as Elsinore, is a city in eastern Denmark. It is known for its castle Kronborg, which William Shakespeare most presumably had in mind for his famous play Hamlet.</p> <p>The castle's story dates back to a stronghold, <i>Krogen</i>, built by King Eric VII in the 1420s. Along with the fortress Kärnan, Helsingborg on the opposite coast of Øresund (present day Sweden), it controlled the entranceway to the Baltic Sea. From 1574 to 1585 King Frederick II had the medieval fortress radically transformed into a magnificent Renaissance castle. In 1785 the castle ceased to be a royal residence and was converted into barracks for the army. The army left the castle in 1923, and after a thorough renovation it was opened to the public.</p>	
Faelled Park (27)	<p>The park Fælledparken in Copenhagen, Denmark, was created 1906–1914 by landscape architect Edvard Glæsel in cooperation with the Copenhagen Municipality on the commons. It is used for activities such as walking, sunbathing, running, playgrounds, and soccer.</p>	
Langlinie (27)	<p>A pier, promenade and park in central Copenhagen, Denmark, and home of The Little Mermaid statue. The area has for centuries been a popular destination for excursions and strolls in Copenhagen.</p>	
“Practical exploitation of atomic energy” (30)	<p>The concept of using atomic energy as a means to an end, such as energy production and/or warfare.</p>	
Fissile (31)	<p>In nuclear engineering, fissile material is material capable of sustaining a nuclear fission chain reaction. By definition, fissile material can sustain a chain reaction with neutrons of any energy. Fissile material can be used to fuel thermal-neutron reactors, fast-neutron reactors and nuclear explosives.</p>	
Weisskopf (32)	<p>Victor Frederick "Viki" Weisskopf (September 19, 1908 – April 22, 2002) was an Austrian-born American theoretical physicist. He did postdoctoral work with Werner Heisenberg, Erwin Schrödinger, Wolfgang Pauli and Niels Bohr. During World War II he was Group Leader of the Theoretical Division of the Manhattan Project at Los Alamos, and later campaigned against the proliferation of nuclear weapons.</p>	
Differential equations (32)	<p>A mathematical equation that involves variables like x or y, as well as the rate at which those variables change. Differential equations are special because the solution of a differential equation is itself a function instead of a number. It relates some function with its derivatives. In applications, the functions usually represent physical quantities, the derivatives represent their rates of change, and the equation defines a relationship between the two.</p>	
Kurt Diebner (32)	<p>(13 May 1905 – 13 July 1964) A German nuclear physicist who is well known for directing and administrating the German nuclear energy project, a secretive program aiming to build nuclear weapons for Nazi Germany during the course of World War II. Diebner was the administrative director of the German nuclear</p>	

	<p>program after Adolf Hitler, Führer and Reich Chancellor, authorized this program.</p> <p>Diebner also served as the director of the Nuclear Research Council and a Reich Planning Officer for the German Army until its surrender to Allied Powers in 1945. After the war, Diebner was incarcerated in the United Kingdom and repatriated back to <i>West-Germany</i> in early 1946.</p>
Wirtz (32)	Karl Eugen Julius Wirtz (24 April 1910 – 12 February 1994) was a German nuclear physicist , born in Cologne . He was arrested by the allied British and American Armed Forces and incarcerated at Farm Hall for six months in 1945 under Operation Epsilon .
Jensen (32)	Johannes Hans Daniel Jensen (25 June 1907 – 11 February 1973) was a German nuclear physicist . During World War II , he worked on the German nuclear energy project , known as the Uranium Club , in which he made contributions to the separation of uranium isotopes . After the war Jensen was a professor at the University of Heidelberg . Jensen shared half of the 1963 Nobel Prize for Physics with Maria Goeppert-Mayer for their proposal of the nuclear shell model .
Houtermanns (32)	Friedrich Georg "Fritz" Houtermanns (January 22, 1903 – March 1, 1966) was a Dutch-Austrian-German atomic and nuclear physicist .
Geiger counter (33)	A Geiger counter is an instrument used for detecting and measuring ionizing radiation . Also known as a Geiger-Mueller counter (or Geiger-Müller counter), it detects ionizing radiation such as alpha particles , beta particles , and gamma rays using the ionization effect produced in a Geiger-Müller tube , which gives its name to the instrument. ^[1] In wide and prominent use as a hand-held radiation survey instrument , it is perhaps one of the world's best-known radiation detection instruments. The original operating principle was discovered in 1908 and since the subsequent development of the Geiger-Müller tube in 1928 the counter has been a very popular instrument due to its robust sensing detector and element and relatively low cost.
Kaiser Wilhelm institute (33)	The Kaiser Wilhelm Society for the Advancement of Science (German <i>Kaiser-Wilhelm-Gesellschaft zur Förderung der Wissenschaften</i>) was a German scientific institution established in the German Empire in 1911. Under the Third Reich it was involved in Nazi scientific operations, and after the Second World War concluded, its functions were taken over by the Max Planck Society . The Kaiser Wilhelm Society was an umbrella organisation for many institutes, testing stations, and research units created under its authority.
Army Ordinance (33)	A branch of the armed forces dealing with the supply and storage of weapons, ammunition, and related equipment.
Stockholm (35)	The capital of Sweden and the most populous city in the Nordic countries . Stockholm is the cultural, media, political, and economic centre of Sweden.
“Anarchy and civil war” (35)	The German Revolution or November Revolution (German : <i>Novemberrevolution</i>) was a civil conflict in the German Empire at the end of the First World War that resulted in the replacement of the German federal constitutional monarchy with a democratic parliamentary republic that later became known as the Weimar

	<p>Republic. The revolutionary period lasted from November 1918 until the adoption in August 1919 of the Weimar Constitution. The causes of the revolution were the extreme burdens suffered by the population during the four years of war, the strong impact of the defeat on the German Empire and the social tensions between the general population and the elite of aristocrats and bourgeoisie who held power and had just lost the war.</p>
Hiroshima (36)	<p>Hiroshima was the first city targeted by a nuclear weapon, when the United States Army Air Forces (USAAF) dropped an atomic bomb on the city at 8:15 a.m. on August 6, 1945, near the end of World War II. Much of the city was destroyed. An estimated 70,000 persons, of whom 20,000 were Japanese soldiers and 20,000 were Korean slave laborers, were killed, and another 70,000 were injured.</p>
Teller (36)	<p>Edward Teller was a Hungarian-American theoretical physicist who is known colloquially as "the father of the hydrogen bomb", although he did not care for the title. He made numerous contributions to nuclear and molecular physics, spectroscopy, and surface physics. Teller was born in Hungary and emigrated to the United States in the 1930s. He was an early member of the Manhattan Project, charged with developing the first atomic bomb; during this time he made a serious push to develop the first fusion-based weapons as well, but these were deferred until after World War II. After his controversial testimony in the security clearance hearing of his former Los Alamos Laboratory superior, J. Robert Oppenheimer, Teller was ostracized by much of the scientific community. He continued to find support from the U.S. government and military research establishment, particularly for his advocacy for nuclear energy development, a strong nuclear arsenal, and a vigorous nuclear testing program.</p>
Szilard (36)	<p>Leo Szilard (born Leó Spitz; February 11, 1898 – May 30, 1964) was a Hungarian-German-American physicist and inventor. He conceived the nuclear chain reaction in 1933, patented the idea of a nuclear reactor with Enrico Fermi in 1934, and in late 1939 wrote the letter for Albert Einstein's signature that resulted in the Manhattan Project that built the atomic bomb.</p> <p>Szilard moved to the United States in 1938, where he worked with Enrico Fermi and Walter Zinn on means of creating a nuclear chain reaction. He was present when this was achieved on December 2, 1942. He worked for the Manhattan Project's Metallurgical Laboratory on aspects of nuclear reactor design. He drafted the Szilard petition advocating a demonstration of the atomic bomb, but the Interim Committee chose to use them against cities without warning.</p>
Roosevelt (1939) (36)	<p>Franklin Delano Roosevelt (30, 1882 – April 12, 1945), often referred to by his initials FDR, was an American statesman and political leader who served as the 32nd President of the United States from 1933 until his death in 1945.</p> <p>Under Roosevelt's tenure as President, the Manhattan Project was set into motion. He had direct responsibility for establishing and funding the project and its forerunners. Before his death in office in 1945, he made decisions that would influence the eventual choice to drop the atomic bombs on Japanese cities, as well as post-war nuclear policy.</p>

	<p>In October 1939, economist Alexander Sachs arranged a meeting with Roosevelt in order to present the famous letter from Albert Einstein and Leo Szilard, detailing the benefits of nuclear research, as well as the harm that could come from potential weapons. At the end of Sachs's summary of the letter, Roosevelt responded, "Alex, what you are after is to see that the Nazis don't blow us up." Roosevelt took action, approving the formation of what became the Advisory Committee on Uranium (Uranium Committee).</p>
Los Alamos (36)	<p>Los Alamos National Laboratory (Los Alamos or LANL for short) is a United States Department of Energy national laboratory initially organized during World War II for the design of nuclear weapons as part of the Manhattan Project. It is located a short distance northwest of Santa Fe, New Mexico in the southwestern United States.</p> <p>Los Alamos was the centre for design and overall coordination, while the other labs, today known as Oak Ridge and Argonne, concentrated on the production of uranium and plutonium bomb fuels. Los Alamos was the heart of the project, collecting together some of the world's most famous scientists, among them numerous Nobel Prize winners. The site was known variously as Project Y, Los Alamos Laboratory, and Los Alamos Scientific Laboratory through this period. The lab's existence was announced to the world in the post-WWII era, when it became known universally as Los Alamos.</p>
Molten phosphorous (36)	<p>Phosphorus is a chemical element with symbol P and atomic number 15. Elemental phosphorus exists in two major forms, white phosphorus and red phosphorus, but because it is highly reactive, phosphorus is never found as a free element on Earth.</p>
Farm Hall, in Huntingdonshire... on the River Ouse (38)	<p>Operation Epsilon was the codename of a program in which Allied forces near the end of World War II detained ten German scientists who were thought to have worked on Nazi Germany's nuclear program. The scientists were captured between May 1 and June 30, 1945, as part of the Allied Alsos Mission, mainly as part of its Operation Big sweep through southwestern Germany.</p> <p>They were interned at Farm Hall, a bugged house in Godmanchester, near Cambridge, England, from July 3, 1945, to January 3, 1946.^[2] The primary goal of the program was to determine how close Nazi Germany had been to constructing an atomic bomb by listening to their conversations. Those interned were Erich Bagge, Kurt Diebner, Walther Gerlach, Otto Hahn, Paul Harteck, Werner Heisenberg, Horst Korsching, Max von Laue, Carl Friedrich von Weizsäcker, and Karl Wirtz.</p>
Major Rittner (38)	<p>British military officer and scientist-herd, Major Rittner had charge over the German scientists taken by ALSOS, first to Versailles and thence to Farm Hall, Huntingdonshire. He was responsible for reports to Eric Welsh, a naval intelligence officer, and to Michael Perrin. Thomas Powers says Rittner took Otto Hahn aside to tell him privately that his discoveries had led to the development and use of the first atomic bomb. The scientists' keeper also offered Hahn gin and comfort.</p>
Geoler (38)	<p>An antiquated English term for jailer.</p>

Gerlach (39)	The project director of Germany's atomic research of which Heisenberg was a part. He was the liaison between the project and the German government. He was unaware of the weaponry capabilities of this research.
Nagasaki bomb (39)	<p>The atomic bombs dropped on Japan had been created through the Manhattan Project. They created two bombs. The first bomb was called Little Boy, and was to be dropped on Hiroshima, and the second bomb was called Fat Man, and was to be dropped on Nagasaki. Six days after the explosion over Nagasaki, and after the Soviet invasion of Manchukuo, Japan surrendered to the Allied Powers on August 15. Japan signed the surrender paper on September 2. This officially ended the Pacific War and World War II.</p> <p>Hiroshima and Nagasaki were chosen for several reasons. First, both cities were unsuitable for firebombing, mainly due to the river deltas preventing firestorms from being very effective. Second, both cities had terrains which provided a good measurement for damage caused by the nuclear bombs.^[4] Third and finally, both cities contained strategic personnel and installations; Hiroshima was the headquarters of the 2nd General Army and 5th Division with 40,000 Japanese combatants stationed within the city's limit, and Nagasaki contained two large Mitsubishi armament factories and many other medium-to-small workshops and plants providing vital war components for Japan's war machine. In both cities, as with other Japanese cities, these targets were mixed in with civilian homes, schools, and temples. For example, at least 54% of the deaths in Hiroshima were combatants and slave laborers while 72% of the deaths in Nagasaki were war industry employees and slave laborers. Between 39,000–80,000 people died in the Nagasaki bombing.</p> <p>The decision to use nuclear weapons on Japan was made after an analysis showed that more than a million people—combatants of both nations and civilians—would die if Japan was invaded by Allied forces. The nuclear bombings, while shocking and unprecedented, actually paled in comparison with the <i>Operation Meetinghouse</i> firebombing of Tokyo on March 9/10, 1945, which killed 100,000 civilians and destroyed 16 square miles in a single night. Had it not been for the nuclear weapons, the U.S. would have resorted to firebombing Hiroshima and Nagasaki which would have caused equal amount of damage, but did not produce the shock value that nuclear weapons have.^[6] In addition, doing nothing or waiting it out for surrender was not an option because hundreds of thousands of combatants, civilians, and prisoners of war were dying each month in Japanese-occupied lands.</p>
Meeting with Albert Speer (40)	In a 1942 meeting with Albert Speer, the Minister of Armaments and War Production, Heisenberg made a reference to the amount of U-235 necessary and caused a small sensation when he used the word “bomb” – many of the scientists and officials present were not aware that this was actually possible.
RAF (41)	The Royal Air Force (RAF) is the United Kingdom's aerial warfare force . Formed towards the end of the First World War on 1 April 1918, it is the oldest independent air force in the world. It played a large part in the Second World War where it fought its most famous campaign, the Battle of Britain .

	The largest RAF effort during the war was the strategic bombing campaign against Germany by Bomber Command . While RAF bombing of Germany began almost immediately upon the outbreak of war, under the leadership of Air Chief Marshal Harris , these attacks became increasingly devastating from 1942 onward as new technology and greater numbers of superior aircraft became available. The RAF adopted night-time area bombing on German cities such as Hamburg and Dresden , and developed precision bombing techniques for specific operations.
Lübeck (41)	A city in Schleswig-Holstein , northern Germany , and one of the major ports of Germany .
Rostock (41)	A city in the north German state Mecklenburg-Vorpommern . Rostock is on the Warnow river; the district of Warnemünde , 12 kilometres (7 miles) north of the city centre, is directly on the Baltic Sea coast. Rostock is home to one of the oldest universities in the world , the University of Rostock , founded in 1419.
Cologne (41)	Köln is the largest city of Germany's most populous federal state of North Rhine-Westphalia and the largest city on the Rhine. Cologne was one of the most heavily bombed cities in Germany during World War II, with the Royal Air Force (RAF) dropping 34,711 long tons (35,268 tonnes) of bombs on the city . ^[5] The bombing reduced the population by 95%, mainly due to evacuation, and destroyed almost the entire city.
Reactor (41)	A nuclear reactor , formerly known as an atomic pile , is a device used to initiate and control a self-sustained nuclear chain reaction . Nuclear reactors are used at nuclear power plants for electricity generation and in propulsion of ships . Heat from nuclear fission is passed to a working fluid (water or gas), which in turn runs through steam turbines . These either drive a ship's propellers or turn electrical generators' shafts. Nuclear generated steam in principle can be used for industrial process heat or for district heating . Some reactors are used to produce isotopes for medical and industrial use, or for production of weapons-grade plutonium . Some are run only for research .
Berlin (41)	The capital and largest city of Germany by both area and population. Berlin is home to world-renowned universities, orchestras, museums, and entertainment venues, and is host to many sporting events. Berlin in the 1920s was the third largest municipality in the world.
Swabia (41)	A cultural, historic and linguistic region in southwestern Germany .



Swabian Jura (41)	Also named Swabian Alps in English, it is a mountain range in Baden-Württemberg, Germany .
Haigerloch (41)	A town in the north-western part of the Swabian Alb in Germany .
Hambro (41)	Sir Charles Hambro (1897-1963) joined the Ministry of Economic Warfare at the start of WWII and later became a colonel on the general staff. After the fall of France in 1941, he entered Special Operations Executive and became head of the Scandinavian section. In this capacity, he aided the resistance in Denmark. He went to Washington in 1943 as a member of the Combined Raw Materials Board. Among his duties was the exchange of information with the US on the atom bomb.
Perrin (41)	Francis Perrin (1901-1992) 1939 article, " <i>Calcul relatif aux conditions éventuelles de transmutation en chaire de l'uranium.</i> ", like Flügge's article in <i>Die Naturwissenschaft</i> , created interest in the possibility of atomic weapons; he proposed in the piece that uranium would fission at a critical point. He served in the French army from the beginning of WWII until 1941
Allies (41)	The Allies of World War II , called the United Nations from the 1 January 1942 declaration , were the countries that together opposed the Axis powers during the Second World War (1939–1945). The Allies promoted the alliance as a means to control German , Japanese and Italian aggression. At the start of the war on 1 September 1939, the Allies consisted of France , Poland and the United Kingdom , as well as their dependent states , such as British India . Within days they were joined by the independent Dominions of the British Commonwealth : Australia , Canada , New Zealand and South Africa . ^[1] After the start of the German invasion of North Europe until the Balkan Campaign , the Netherlands , Belgium , Greece , and Yugoslavia joined the Allies. After first having cooperated with Germany in invading Poland whilst remaining neutral in the Allied-Axis conflict, the Soviet Union perforce joined the Allies in June 1941 after being invaded by Germany . The United States provided war materiel and money all along, and officially joined in December 1941 after the Japanese attack on Pearl Harbor . China had already been in a prolonged war with Japan since the Marco Polo Bridge Incident of 1937, but officially joined the Allies in 1941.
Cadmium (42)	A chemical element with symbol Cd and atomic number 48. This soft, bluish-white metal is chemically similar to the two other stable metals in group 12 , zinc and mercury . Cadmium is used in the control rods of nuclear reactors, acting as a very effective "neutron poison" to control neutron flux in nuclear fission . ^[36] When cadmium rods are inserted in the core of a nuclear reactor, cadmium absorbs neutrons, preventing them from creating additional fission events, thus controlling the amount of reactivity. The pressurized water reactor designed by Westinghouse Electric Company uses an alloy consisting of 80% silver, 15% indium, and 5% cadmium.
Heavy water (42)	A form of water that contains a larger than normal amount of the hydrogen isotope deuterium . The presence of deuterium gives the chemical different nuclear properties, and the increase of mass gives it different physical and chemical properties compared to normal "light water". Heavy water is sometimes used in nuclear reactors . It is a more efficient neutron moderator than regular water, allowing the use of unenriched uranium as fuel. Pure heavy

	water is not radioactive , but heavy water that has been through a nuclear reactor is slightly radioactive.
Neutron growth (42)	One possible form of a nuclear reaction occurs with the input of one neutron with an output of two. This neutron growth is important in contributing neutrons to a nuclear weapon.
Air raids (42)	Strategic bombing during World War II was the sustained aerial attack on railways, harbours, cities, workers' housing, and industrial districts in enemy territory during World War II . Strategic bombing is a military strategy which is distinct from both close air support of ground forces and tactical air power . Strategic bombing often involved bombing areas inhabited by civilians and some campaigns were deliberately designed to target civilian populations in order to terrorize and disrupt their usual activities.
Fugue (44)	A contrapuntal composition in which a short melody or phrase (the subject) is introduced by one part and successively taken up by others and developed by interweaving the parts.
Colloquium (48)	an academic conference or seminar.
Age (48)	Aage Niels Bohr (19 June 1922 – 8 September 2009) was a Danish nuclear physicist who shared the Nobel Prize in Physics in 1975 with Ben Mottelson and James Rainwater "for the discovery of the connection between collective motion and particle motion in atomic nuclei and the development of the theory of the structure of the atomic nucleus based on this connection". Since his father, Niels Bohr , had won the prize in 1922, he and his father were one of the six pairs of fathers and sons who have both won the Nobel Prize and one of the four pairs who have both won the Nobel Prize in Physics.
Ernest (48)	Ernest David Bohr (7 March 1924 – 26 February 2018) was a Danish lawyer, former barrister , and field hockey player who played for Denmark in the 1948 Summer Olympics in London . He is one of Niels Bohr's four sons.
Kramers (49)	Hendrik Anthony "Hans" Kramers (2 February 1894 – 24 April 1952) was a Dutch physicist who worked with Niels Bohr to understand how electromagnetic waves interact with matter.
Dirac (49)	Paul Adrien Maurice Dirac OM FRS^[7] (/diˈræk/ ; 8 August 1902 – 20 October 1984) was an English theoretical physicist who is regarded as one of the most significant physicists of the 20th century. Dirac made fundamental contributions to the early development of both quantum mechanics and quantum electrodynamics . Among other discoveries, he formulated the Dirac equation which describes the behaviour of fermions and predicted the existence of antimatter . Dirac shared the 1933 Nobel Prize in Physics with Erwin Schrödinger "for the discovery of new productive forms of atomic theory ". ^[8] He also made significant contributions to the reconciliation of general relativity with quantum mechanics. He sailed with Heisenberg on an ocean liner to a conference in Japan in August 1929.
Pagoda (49)	A Hindu or Buddhist temple or sacred building, typically a many-tiered tower, in India and East Asia.
Pascual Jordan (50)	Ernst Pascual Jordan (18 October 1902 – 31 July 1980) was a German theoretical and mathematical physicist who made significant contributions to quantum mechanics and quantum field theory .

Rome (50)	The capital city of Italy , Rome was once the capital and culturally and economic center of the Roman Empire, as well as being the spiritual center of the Catholic world, being the city in which the Vatican is situated.
Paris (50)	The capital and most populous city of France . Since the 17th century, Paris has been one of Europe's major centres of finance, commerce, fashion, science, and the arts.
Joliot (50)	Jean Frédéric Joliot-Curie (French: [ʒə̃.ʁe.dɛ.ʁik.ʒo.ljo.ky.ʁi] ; 19 March 1900 – 14 August 1958), born <i>Jean Frédéric Joliot</i> , was a French physicist , husband of Irène Joliot-Curie with whom he was jointly awarded the Nobel Prize in Chemistry
De Broglie (50)	Louis Victor Pierre Raymond de Broglie, duc de Broglie (15 August 1891 – 19 March 1987) was a French physicist who made groundbreaking contributions to quantum theory . In his 1924 PhD thesis, he postulated the wave nature of electrons and suggested that all matter has wave properties . This concept is known as the de Broglie hypothesis, an example of wave-particle duality , and forms a central part of the theory of quantum mechanics . De Broglie won the Nobel Prize for Physics in 1929, after the wave-like behaviour of matter was first experimentally demonstrated in 1927.
Landau (50)	Landau in der Pfalz , is an autonomous town in southern Rhineland-Palatinate , Germany .
Uhlenbeck (50)	George Eugene Uhlenbeck (December 6, 1900 – October 31, 1988) was a Dutch-American theoretical physicist .
Hamburg (50)	Officially the Free and Hanseatic City of Hamburg ; German : <i>Freie und Hansestadt Hamburg</i>), it is the second-largest city in Germany and one of its 16 federal states. Hamburg is Europe's third-largest port and a major European science, research, and education hub , with several universities and institutions. 
Ehrenfest (51)	Paul Ehrenfest (18 January 1880 – 25 September 1933) was an Austrian and Dutch theoretical physicist , who made major contributions to the field of statistical mechanics and its relations with quantum mechanics , including the theory of phase transition^[1] and the Ehrenfest theorem .
Relativistic analysis (51)	Special relativity (or the special theory of relativity) is a theory in physics that was developed and explained by Albert Einstein in 1905. It applies to all physical phenomena, so long as gravitation is not significant. Special relativity applies to Minkowski space , or "flat spacetime" (phenomena which are not influenced by gravitation). This theory is based on the constancy of the speed of light in all inertial frames of reference and the principle of relativity. <ul style="list-style-type: none"> inertial frame of reference: a frame of reference that describes time and space homogeneously, isotropically, and in a time-independent manner. Shorthand: space the same everywhere at all times.

	<ul style="list-style-type: none"> principle of relativity: the equations describing the laws of physics have the same form in all frames of reference. Shorthand: same equations work everywhere and at all times.
Copenhagen Interpretation (51)	<p>An expression of the meaning of quantum mechanics that was largely devised in the years 1925 to 1927 by Niels Bohr and Werner Heisenberg. It remains one of the most commonly taught interpretations of quantum mechanics.^[1] According to the Copenhagen interpretation, physical systems generally do not have definite properties prior to being measured, and quantum mechanics can only predict the probabilities that measurements will produce certain results. The act of measurement affects the system, causing the set of probabilities to reduce to only one of the possible values immediately after the measurement. This feature is known as wave function collapse.</p> <p>There have been many objections to the Copenhagen interpretation over the years. These include: discontinuous jumps when there is an observation, the probabilistic element introduced upon observation, the subjectiveness of requiring an observer, the difficulty of defining a measuring device, and the necessity of invoking classical physics to describe the "laboratory" in which the results are measured.</p> <p>Alternatives to the Copenhagen interpretation include the many-worlds interpretation, the De Broglie–Bohm (pilot-wave) interpretation, quantum Bayesianism, and quantum decoherence theories.</p>
Enlightenment (51)	A European intellectual movement of the late 17th and 18th centuries emphasizing reason and individualism rather than tradition.
Heligoland (52)	A small German archipelago in the North Sea . The islands were at one time Danish and later British possessions. They are the only German islands not in the immediate vicinity of the mainland.
Hay fever (52)	Allergic rhinitis , also known as hay fever , is a type of inflammation in the nose which occurs when the immune system overreacts to allergens in the air. Signs and symptoms include a runny or stuffy nose, sneezing , red, itchy, and watery eyes, and swelling around the eyes. Allergic rhinitis is the type of allergy that affects the greatest number of people. It is most common between the ages of twenty and forty.
North Sea (52)	<p>A sea located between the United Kingdom, Denmark, Norway, Sweden, Germany, the Netherlands, Belgium and France. it connects to the ocean through the English Channel in the south and the Norwegian Sea in the north.</p> 
Matrix calculus (53)	In mathematics , matrix calculus is a specialized notation for doing multivariable calculus , especially over spaces of matrices . It collects the various partial derivatives of a single function with respect to many variables,

	<p>and/or of a multivariate function with respect to a single variable, into vectors and matrices that can be treated as single entities. This greatly simplifies operations such as finding the maximum or minimum of a multivariate function and solving systems of differential equations. The notation used here is commonly used in statistics and engineering, while the tensor index notation is preferred in physics.</p> <p>Tensor index notation is even more complicated and not relevant enough to be explained here. However, more information on it can be found by following the link embedded above, should you be interested.</p>
<p>Schrödinger's wave formulation (53)</p>	<p>the Schrödinger equation is a mathematical equation that describes the changes over time of a physical system in which quantum effects, such as wave-particle duality, are significant. These systems are referred to as quantum (mechanical) systems. The equation is considered a central result in the study of quantum systems, and its derivation was a significant landmark in the development of the theory of quantum mechanics.</p> <p>The equation is mathematically described as a linear partial differential equation, which describes the time-evolution of the system's wave function (also called a "state function"). The concept of a wavefunction is a fundamental postulate of quantum mechanics, that defines the state of the system at each spatial position, and time.</p> <p>In the Copenhagen interpretation of quantum mechanics, the wave function is the most complete description that can be given of a physical system. Solutions to Schrödinger's equation describe not only molecular, atomic, and subatomic systems, but also macroscopic systems, possibly even the whole universe.^{[4]:292ff} Schrödinger's equation is central to all applications of quantum mechanics including quantum field theory which combines special relativity with quantum mechanics. Theories of quantum gravity, such as string theory, also do not modify Schrödinger's equation.</p> <p>The Schrödinger equation is not the only way to study quantum mechanical systems and make predictions, as there are other quantum mechanical formulations such as matrix mechanics, introduced by Werner Heisenberg, and path integral formulation, developed chiefly by Richard Feynman. Paul Dirac incorporated matrix mechanics and the Schrödinger equation into a single formulation.</p>
<p>Wave mechanics (53)</p>	<p>See "Schrödinger's wave formulation (53)".</p>
<p>Matrix mechanics (53)</p>	<p>A formulation of quantum mechanics created by Werner Heisenberg, Max Born, and Pascual Jordan in 1925. Matrix mechanics was the first conceptually autonomous and logically consistent formulation of quantum mechanics. The matrix form of quantum physics is still used since it is useful and convenient for some purposes. Other mathematical ways, particularly Erwin Schrödinger's equation using a wave function, are mathematically equivalent but are easier to use for other purposes.</p>

Pope (54)	Also known as the supreme pontiff (from Latin <i>pontifex maximus</i> "greatest priest"), the Pope is the Bishop of Rome and <i>ex officio</i> leader of the worldwide Catholic Church . Since 1929, the pope has also been head of state of Vatican City , ^[4] a city-state entirely enclaved within Rome, Italy .
Holy Office (54)	The Congregation for the Doctrine of the Faith (Latin: <i>Congregatio pro Doctrina Fidei</i> ; CDF) is the oldest among the nine congregations of the Roman Curia . It was founded to defend the church from heresy ; today, it is the body responsible for promulgating and defending Catholic doctrine . Formerly known as the Supreme Sacred Congregation of the Roman and Universal Inquisition , it is informally known in many Catholic countries as the Holy Office , and between 1908 and 1965 was officially known as the Supreme Sacred Congregation of the Holy Office .
Inquisition (54)	<p>A group of institutions within the government system of the Catholic Church whose aim was to combat public heresy committed by baptized Christians. It started in 12th-century France to combat religious dissent. During the Late Middle Ages and early Renaissance, the concept and scope of the Inquisition significantly expanded in response to the Protestant Reformation and the Catholic Counter-Reformation. It expanded to other European countries,^[2] resulting in the Spanish Inquisition and Portuguese Inquisition.</p> <p>These inquisitions focused particularly on the issue of Jewish anusim and Muslim converts to Catholicism, partly because these minority groups were more numerous in Spain and Portugal than in many other parts of Europe, and partly because they were often considered suspect due to the assumption that they had secretly reverted to their previous religions.</p> <p>Except within the Papal States, the institution of the Inquisition was abolished in the early 19th century, after the Napoleonic Wars in Europe and after the Spanish American wars of independence in the Americas. The institution survived as part of the Roman Curia, but in 1908 was given the new name of "Supreme Sacred Congregation of the Holy Office". In 1965 it became the Congregation for the Doctrine of the Faith</p>
Wave theory (54)	See 'Schrödinger's wave formulation (53)'.
Cloud chamber (55)	A cloud chamber , also known as a Wilson cloud chamber , is a particle detector used for visualizing the passage of ionizing radiation . A cloud chamber consists of a sealed environment containing a supersaturated vapor of water or alcohol . An energetic charged particle (for example, an alpha or beta particle) interacts with the gaseous mixture by knocking electrons off gas molecules via electrostatic forces during collisions, resulting in a trail of ionized gas particles. The resulting ions act as condensation centers around which a mist-like trail of small droplets form if the gas mixture is at the point of condensation. These droplets are visible as a "cloud" track that persist for several seconds while the droplets fall through the vapor. These tracks have characteristic shapes. For example, an alpha particle track is thick and straight, while an electron track is wispy and shows more evidence of deflections by collisions. Cloud chambers played a prominent role in the

	experimental particle physics from the 1920s to the 1950s, until the advent of the bubble chamber .
Blegdamsvej (56)	A street in Copenhagen, Denmark .
Bohr's progress in Leiden in 1925 (56)	<p>The Bohr–Einstein debates were a series of public disputes about quantum mechanics between Albert Einstein and Niels Bohr. Their debates are remembered because of their importance to the philosophy of science. Despite their differences of opinion regarding quantum mechanics, Bohr and Einstein had a mutual admiration that was to last the rest of their lives.</p> <p>The debates represent one of the highest points of scientific research in the first half of the twentieth century because it called attention to an element of quantum theory, quantum non-locality, which is central to our modern understanding of the physical world. The consensus view of professional physicists has been that Bohr proved victorious in his defense of quantum theory, and definitively established the fundamental probabilistic character of quantum measurement.</p>
Causality (57)	The principle that everything has a cause; the relationship between cause and effect.
Photon (57)	<p>Photons are particles which transmit light. In other words, light is carried over space by photons. Photon is an elementary particle that is its own antiparticle. In quantum mechanics each photon has a characteristic quantum of energy that depends on frequency: A photon associated with light at a higher frequency will have more energy (and be associated with light at a shorter wavelength).</p> <p>Photons have a rest mass of 0 (zero). However, Einstein's theory of relativity says that they do have a certain amount of momentum. A photon is usually given the symbol γ (gamma).</p>
Indeterminate recoil (57)	Atomic recoil is the result of the interaction of an atom with an energetic elementary particle , when the momentum of the interacting particle is transferred to the atom as whole without altering non-translational degrees of freedom of the atom. It is a purely quantum phenomenon. In nuclear recoil , momentum transfers to the atomic nucleus as whole.
Classical mechanics (57)	<p>Classical mechanics describes the motion of macroscopic objects. If the present state of an object is known it is possible to predict by the laws of classical mechanics how it will move in the future (determinism) and how it has moved in the past (reversibility). The earliest development of classical mechanics is often referred to as Newtonian mechanics.</p> <p>Classical mechanics provides extremely accurate results when studying large objects that are not extremely massive and speeds not approaching the speed of light. When the objects being examined have about the size of an atom diameter, it becomes necessary to introduce the other major sub-field of mechanics: quantum mechanics. To describe velocities that are not small compared to the speed of light, special relativity is needed. In case that objects become extremely massive, General relativity becomes applicable.</p>
Carlsberg (58)	See 'Ny-Carlsberg (11)'.

Quantum of light (58)	The quantum of light is the photon. We are not describing it as a particle or a wave, as such, but as a lump of energy which behaves like a particle and a wave in some cases. We are saying that the photon is the smallest part of light which could be measured, given perfect equipment. See 'Photon (57)'.
Particle mechanics (58)	The study of the <u>motion</u> of individual particles.
Particle (58)	<p>A small <u>localized object</u> to which can be ascribed several <u>physical</u> or <u>chemical properties</u> such as <u>volume</u>, <u>density</u> or <u>mass</u>.^{[1][2]} They vary greatly in size or quantity, from <u>subatomic particles</u> like the <u>electron</u>, to <u>microscopic particles</u> like <u>atoms</u> and <u>molecules</u>, to <u>macroscopic particles</u> like <u>powders</u> and other <u>granular materials</u>.</p> <p>In <u>particle physics</u>, an elementary particle or fundamental particle is a <u>subatomic particle</u> with no substructure, thus not composed of other particles.^[1] Particles currently thought to be elementary include the fundamental <u>fermions</u> (<u>quarks</u>, <u>leptons</u>, <u>antiquarks</u>, and <u>antileptons</u>), which generally are "matter particles" and "<u>antimatter</u>particles", as well as the fundamental <u>bosons</u> (<u>gauge bosons</u> and the <u>Higgs boson</u>), which generally are "force particles" that mediate <u>interactions</u> among fermions.^[1] A particle containing two or more elementary particles is a <u>composite particle</u>.</p>
Wave (58)	<p>A disturbance that transfers <u>energy</u> through <u>matter</u> or space, with little or no associated <u>mass</u>transport(<u>Mass transfer</u>). Waves consist of <u>oscillations</u> or <u>vibrations</u> of a physical <u>medium</u> or a <u>field</u>, around relatively fixed locations.</p> <p>There are two main types of waves: <u>mechanical</u> and <u>electromagnetic</u>. Mechanical waves propagate through a physical matter, whose substance is being deformed. <u>Restoring forces</u> then reverse the deformation. For example, <u>sound</u> waves propagate via air molecules colliding with their neighbours. When the molecules collide, they also bounce away from each other (a restoring force). This keeps the molecules from continuing to travel in the direction of the wave. Electromagnetic waves do not require a medium. Instead, they consist of periodic oscillations of electrical and magnetic fields originally generated by charged particles, and can therefore travel through a <u>vacuum</u>. These types vary in <u>wavelength</u>, and include <u>radio waves</u>, <u>microwaves</u>, <u>infrared radiation</u>, <u>visible light</u>, <u>ultraviolet radiation</u>, <u>X-rays</u> and <u>gamma rays</u>.</p> <p>A wave can be <u>transverse</u>, where a disturbance creates oscillations that are perpendicular to the propagation of energy transfer, or <u>longitudinal</u>: the oscillations are <u>parallel</u> to the direction of energy propagation. While mechanical waves can be both transverse and longitudinal, all electromagnetic waves are transverse in <u>free space</u>.</p>
Peregrination (58)	A journey, especially a long or meandering one.
1927 Como Conference (58)	The Volta Conference was the name given to each of the <u>international conferences</u> held in <u>Italy</u> by the <u>Royal Academy of Science</u> in <u>Rome</u> , and funded by the <u>Alessandro Volta Foundation</u> . In the <u>interwar period</u> , they covered a number of topics in science and humanities, alternating between the

	<p>two. The first conference, held at Lake Como in 1927, led to the public introduction of the uncertainty principle by Niels Bohr and Werner Heisenberg.</p> <p>The Conference is famous for Niels Bohr's first presentation of his ideas on complementarity. His lecture "The Quantum Postulate and the Recent Development of Atomic Theory" became the basis of the Copenhagen interpretation of quantum mechanics; a fuller version was presented at the Fifth Solvay Conference (Brussels) in October.</p>
Protagoras (59)	<p>(c. 490 – c. 420 BC) A pre-Socratic Greek philosopher and is numbered as one of the sophists by Plato. In his dialogue, Protagoras, Plato credits him with having invented the role of the professional sophist.</p> <p>He also is believed to have created a major controversy during ancient times through his statement that, "Man is the measure of all things", interpreted by Plato to mean that there is no absolute truth, but that which individuals deem to be the truth. Although there is reason to question the extent of the interpretation of his arguments that has followed, that concept of individual relativity was revolutionary for the time, and contrasted with other philosophical doctrines that claimed the universe was based on something objective, outside human influence or perceptions.</p>
University chair (61)	Distinguished professors at universities may hold academic, or university, chairs. This is the top administrative post in many academic departments. It is also an honorary position, reflecting high achievement in the chairperson's field.
Halle (61)	A city in the southern part of the German state Saxony-Anhalt . Halle is an economic and educational center in central-eastern Germany . The University of Halle-Wittenberg is the largest university in Saxony-Anhalt, one of the oldest universities in Germany.
Humanism (62)	<p>A philosophical and ethical stance that emphasizes the value and agency of human beings, individually and collectively, and generally prefers critical thinking and evidence(rationalism and empiricism) over acceptance of dogma or superstition.</p> <p>Generally, humanism refers to a perspective that affirms some notion of human freedom and progress. It views humans as solely responsible for the promotion and development of individuals and emphasizes a concern for man in relation to the world.</p>
"Head of the church in Copenhagen" (62)	Referencing Bohr, as the authority in particle physics, and comparing the physics community to a religion.
Plutonium (63)	<p>The chemical element with the atomic number 94 and chemical symbol Pu. Plutonium is the element with the highest atomic number to occur in nature. It is the metal used in most nuclear weapons. It can be made from natural uranium. It is radioactive and can accumulate in bones, which makes the handling of plutonium dangerous.</p> <p>Both plutonium-239 and plutonium-241 are fissile, meaning that they can sustain a nuclear chain reaction, leading to applications in nuclear</p>

	<p>weapons and nuclear reactors. Producing plutonium in useful quantities for the first time was a major part of the Manhattan Project during World War II that developed the first atomic bombs. The Fat Man bombs used in the Trinity nuclear test in July 1945, and in the bombing of Nagasaki in August 1945, had plutonium cores.</p>
Food parcel (65)	A package of food and goods sent to someone; often sent by charities to those in need.
Reich (65)	<p>The term "Third Reich" was adopted by the Nazis as propaganda to legitimize their government as a successor to the retroactively renamed "First" and "Second" Reichs. The "Third Reich" lasted from the Machtergreifung in 1933 until the end of World War II in Europe in 1945.</p> <p>Reich is a German word literally meaning "realm". The terms <i>Kaiserreich</i> (literally "realm of an emperor") and <i>Königreich</i> (literally "realm of a king") are used in German to refer to empires and kingdoms respectively. The Cambridge Advanced Learner's Dictionary indicates that in English usage, the term "the Reich" refers to "Germany during the period of Nazi control from 1933 to 1945".^[2]</p>
The Sound (66)	The Øresund or Öresund (Danish : <i>Øresund</i>), commonly known in English as the Sound , is a strait which forms the Danish–Swedish border , separating Zealand (Denmark) from Scania (Sweden) .
Spin (66)	<p>In physics, spin is the constant rotation of an object, or, an intrinsic form of angular momentum carried by elementary particles, composite particles (hadrons), and atomic nuclei.</p> <p>In some ways, spin is like a vector quantity; it has a definite magnitude, and it has a "direction" (but quantization makes this "direction" different from the direction of an ordinary vector). All elementary particles of a given kind have the same magnitude of spin angular momentum, which is indicated by assigning the particle a spin quantum number.</p>
Auschwitz (66)	<p>Auschwitz concentration camp was a network of concentration and extermination camps built and operated by Nazi Germany in occupied Poland during World War II. It consisted of Auschwitz I (the original concentration camp), Auschwitz II–Birkenau (a combined concentration/extermination camp), Auschwitz III–Monowitz (a labor camp to staff an IG Farben factory), and 45 satellite camps.</p> <p>Auschwitz I was first constructed to hold Polish political prisoners, who began to arrive in May 1940. The first extermination of prisoners took place in September 1941. From early 1942 until late 1944, transport trains delivered Jews to the camp's gas chambers from all over German-occupied Europe, where they were killed en masse.</p> <p>An estimated 1.3 million people were sent to the camp, of whom at least 1.1 million died. Around 90 percent of those were Jews; approximately one in six Jews killed in the Holocaust died at the camp.^{[1][2]} Others deported to Auschwitz included 150,000 Poles, 23,000 Romani and Sinti, 15,000 Soviet prisoners of war, 400 Jehovah's Witnesses, and tens of thousands of others of</p>

	<p>diverse nationalities, including an unknown number of homosexuals. Many of those not killed in the gas chambers died of starvation, forced labor, infectious diseases, individual executions, and medical experiments.</p> <p>In the course of the war, the camp was staffed by 7,000 members of the German Schutzstaffel (SS), approximately 12 percent of whom were later convicted of war crimes. Some, including camp commandant Rudolf Höss, were executed. The Allied Powers did not act on early reports of atrocities at the camp, and their failure to bomb the camp or its railways remains controversial.</p> <p>As Soviet troops approached Auschwitz in January 1945, most of its population was sent west on a death march. The prisoners remaining at the camp were liberated on 27 January 1945, a day now commemorated as International Holocaust Remembrance Day.</p>
Diffusion equation (68)	In physics, this partial differential equation describes the behavior of the collective motion of micro-particles in a material resulting from the random movement of each micro-particle.
Flügge (68)	Siegfried Flügge (16 March 1912, in Dresden – 15 December 1997, in Hinterzarten) was a German theoretical physicist and made contributions to nuclear physics and the theoretical basis for nuclear weapons. ^[1] He worked in the German Uranverein (nuclear weapons project).
Kilogram (68)	The base unit of mass in the International System of Units (SI). The kilogram was originally defined as the mass of a litre (cubic decimetre) of water. That was an inconvenient quantity to precisely replicate, so in 1799 a platinum artefact was fashioned to define the kilogram. One kilogram is a little more than 2.2 pounds .
Peierls (69)	Sir Rudolf Ernst Peierls (5 June 1907 – 19 September 1995) was a German physicist who played a major role in the Manhattan Project and Tube Alloys , Britain's nuclear programme. In March 1940, Peierls co-authored the Frisch–Peierls memorandum with Otto Robert Frisch . This short paper was the first to set out that one could construct an atomic bomb from a small amount of fissile uranium-235 . Until then it had been assumed that such a bomb would require many tons of uranium, and consequently was impractical to build and use. The paper was pivotal in igniting the interest of first the British and later the American authorities in nuclear weapons.
University of Birmingham (69)	A public research university located in Edgbaston , Birmingham , United Kingdom. It received its royal charter in 1900.
Mean free path (74)	In physics , the mean free path is the average distance traveled by a moving particle (such as an atom , a molecule , a photon) between successive impacts (collisions), ^[1] which modify its direction or energy or other particle properties.
Georg Duckwitz (74)	Georg Ferdinand Duckwitz (29 September 1904, Bremen – 16 February 1973) was a German diplomat. During World War II he served as an attaché for Nazi Germany in occupied Denmark . He tipped off the Danes about the German's intended deportation of the Jewish population in 1943 and arranged for their reception in Sweden. It is estimated that he prevented the deportation of 95% of Denmark's Jews in the resulting rescue of the Danish Jews .

<p>The Resistance (74)</p>	<p>The Danish resistance movements (Danish: Modstandsbevægelsen) were an underground insurgency to resist the German occupation of Denmark during World War II. Due to the initially lenient arrangements, in which the Nazi occupation authority allowed the democratic government to stay in power, the resistance movement was slower to develop effective tactics on a wide scale than in some other countries.</p> <p>By 1943, many Danes were involved in underground activities, ranging from producing illegal publications to spying and sabotage. Major groups included the communist BOPA and Holger Danske, both based in Copenhagen. Some small resistance groups such as the Samsing Group and the Churchill Club also contributed to the sabotage effort. Resistance agents killed an estimated 400 Danish Nazis, informers and collaborators until 1944. After that date, they also killed some German nationals.</p> <p>In 1943, the movement scored a great success in rescuing all but 500 of Denmark's Jewish population of 7,000-8,000 from being sent to the Nazi concentration camps by helping transport them to neutral Sweden, where they were offered asylum.</p> <p>Another success was the disruption of the Danish railway network in the days after D-Day, which delayed the movement of German troops to France as reinforcements.</p>
<p>Red Sea parting (75)</p>	<p>This refers to the Biblical escape of the Israelites from the Egyptians. According to the Exodus account, Moses held out his staff, and the Red Sea was parted by God. The Israelites walked on the exposed dry ground and crossed the sea, followed by the Egyptian army. Moses again moved his staff once the Israelites had crossed, and the sea closed again, drowning the entire Egyptian army.</p>
<p>Observable quantities (76)</p>	<p>In physics, an observable is a physical quantity that can be measured. Examples include position and momentum.</p>
<p>Quantum ethics (76)</p>	<p>See article(s) on provided in dramaturgical packet.</p>
<p>Bavaria (76)</p>	<p><i>Bayern</i> is a landlocked federal state of Germany, occupying its southeastern corner. Bavaria is the largest German state by land area. Its territory comprises roughly a fifth of the total land area of Germany. Bavaria's capital and largest city, Munich, is the third-largest city in Germany.</p> 

<p>Württemberg (76)</p>	<p>A historical German territory roughly corresponding to the cultural and linguistic region of Swabia (41). Together with Baden and Hohenzollern, two other historical territories, it now forms the Federal State of Baden-Württemberg.</p>	
<p>Alps (76)</p>	<p>The highest and most extensive mountain range system that lies entirely in Europe, stretching through France, Switzerland, Italy, Monaco, Liechtenstein, Austria, Germany, and Slovenia.</p>	
<p>“familiar black tunic” (76)</p>	<p>The military-like uniform of the SS.</p>	
<p>Travel order (76)</p>	<p>A travel order identifies the travel purpose and includes necessary financial information for budgetary and reimbursement purposes.</p>	
<p>Gammertingen (77)</p>	<p>A town in the district of Sigmaringen, in Baden-Württemberg, Germany.</p>	
<p>Biberach (77)</p>	<p>Could refer to either: Biberach, Baden, a municipality in the district of Ortenau in Baden-Württemberg in Germany. Or Biberach an der Riss, a town in the south of Germany. It is the capital of Biberach district, in the Upper Swabia region of the German state of Baden-Württemberg.</p>	

Memmingen (77)	A town in Swabia , Bavaria , Germany . It is the economic, educational and administrative centre of the Danube-Iller region.
Mindelheim (77)	A town in Swabia , Bavaria , Germany . The town is the capital of the Unterallgäu district.
Kaufbeuren (77)	An independent town in the Regierungsbezirk of Swabia , Bavaria .
Schöngau (77)	A town in Bavaria , near the Alps .