

Hedy Lamarr, Radio Inventor,
An Archivist's Note; and
A Biography of Hedy Lamarr, following:

A Tribute to Radio Inventor Hedy Lamarr

By David Harris, CHRS Fellow and Assistant Librarian

I suggest CHRS create a “tribute room” to movie icon Hedy Lamarr somewhere prominently in the Radio Central building in Alameda (perhaps alongside another such room for another California radio pioneer, Lee DeForest).



From 1938 to the early 1950s, Hedy Lamarr was the beautiful, iconic leading lady of MGM's “Golden Age” and afterwards, famous in

the roles of Delilah, Helen of Troy, Joan of Arc, Gaby (*Algiers*), Dolores Ramirez (*Tortilla Flat*), Tondelayo (*White Cargo*), Karen Vanmeer (*Boom Town*), Lizzie (*Comrade X*), and the female lead in two dozen other films. Millions around the world only knew of her as the gorgeous, exotic Hollywood actress. But to her family and a few friends she lived a secret life as a self-taught inventor.¹

Her off-screen life was very private. In her spare time she experimented with, and diagrammed concepts for inventions. She said these ideas “kept popping into” her head. One of these involved the idea of using Radio-Frequency-Hopping to prevent the jamming of radio-controlled torpedoes being used in World War Two against the Nazis. Lamar hated the Nazis, having escaped from them. She worked on this invention with the help of her friend, pianist and composer George Antheil. Lamarr and Antheil were awarded patent US 2292387A for a “Secret Communication System” device on August 11, 1942, filed under Lamarr’s married name at the time, Hedy Kiesler Markey.

This involved synchronizing a miniaturized player-piano mechanism with a radio transmitter, officially described as “Encryption being effected by mechanical apparatus, e.g., rotating cams, switches, keytape punchers.” Unfortunately, the device was difficult to implement with the technology at the time. Moreover, the U.S. Navy opposed inventions originating outside the military, especially from someone from Europe. Twenty years later, in 1962 during the Cuban Missile Crisis, U.S. Navy ships employed an updated version of the Lamar frequency-hopping system.

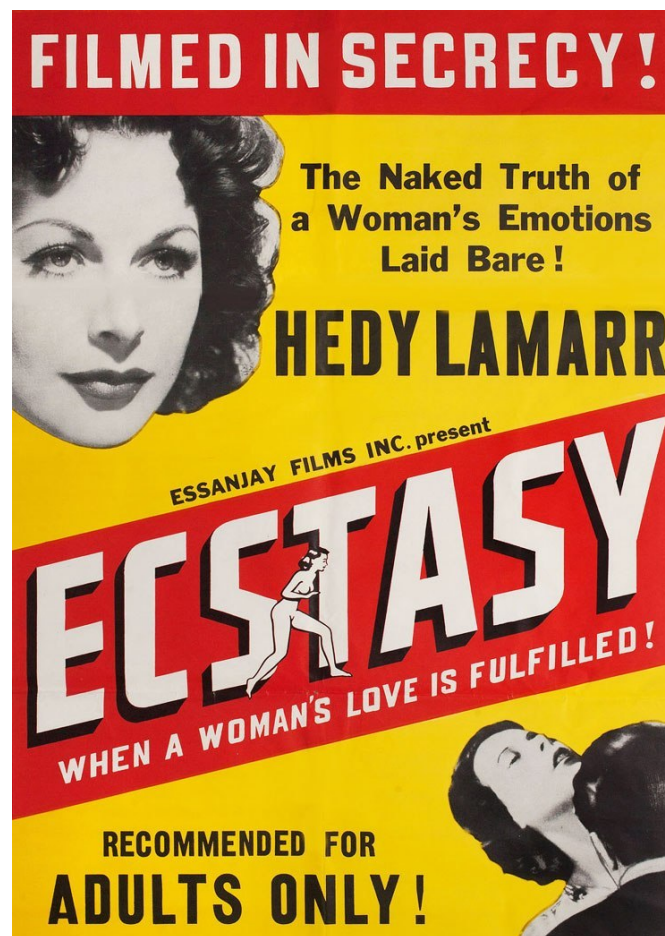
This idea was decades ahead of its time, because it anticipated the use of spread spectrum technology (SST), which has been crucial to the development of encryption in modern WiFi, bluetooth, and the security of both military communications and smart phones, an industry now

¹ See, e.g., Hedy Lamarr: Not just a pretty face, By Melinda Wenner, Scientific American, June 3, 2008: [www \(dot\) scientificamerican \(dot\) com/article/hedy-lamarr-not-just-a-pr/](http://www.scientificamerican.com/article/hedy-lamarr-not-just-a-pr/)

worth many billions of dollars. Since 1945, the patent has been cited at least 62 times by major technology and communications corporations.

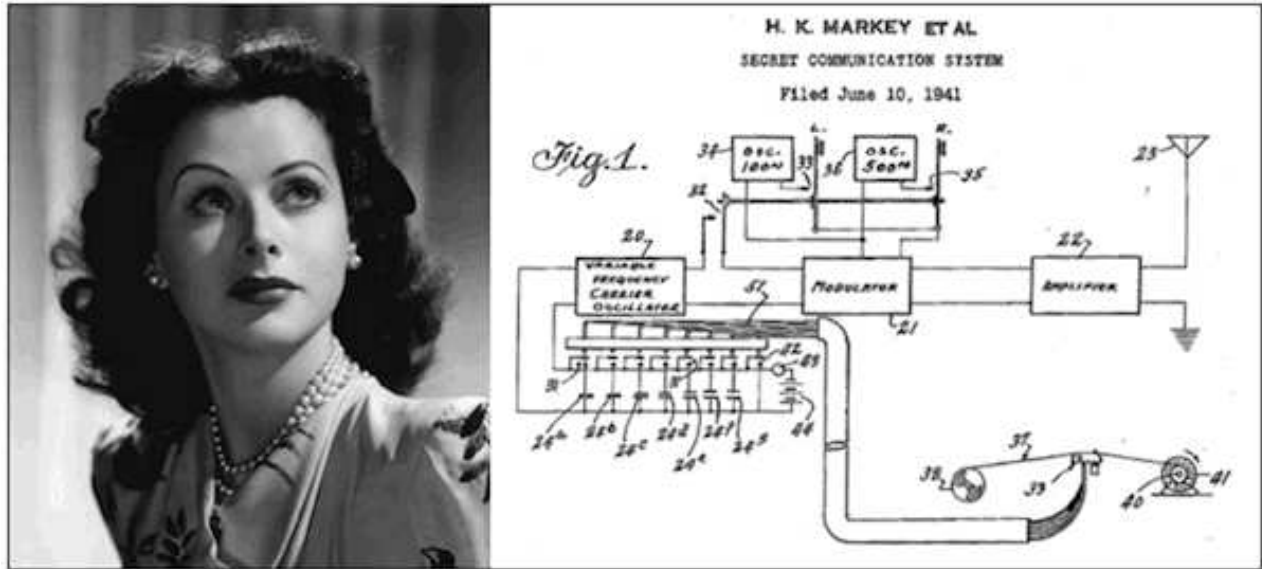
Despite this, Lamarr and Antheil had to wait until 1997 to receive the Electronic Frontier Foundation (EFF) Pioneer Award. Lamarr that same year was the first woman to receive one the “Oscars” of inventing, The Bulbie (TM), the Gnass Spirit of Achievement Award. In 2014, the National Inventors Hall of Fame inducted Lamarr and Antheil posthumously. Neither received any royalties of any kind related to this patent.

A Lamarr room at Radio Central could contain copies of her original diagrams, some devices currently based on frequency-hopping or SST, and, of course, (if we can find them) a few original movie posters of her films.



Hedy Lamarr's First Movie

Archivist's comment by Bart Lee, CHRS and AWA Fellow:



Hedy and Her Invention



The Hedy Lamarr mug!

Recently a movie explored her life and career:



Review: 'Bombshell: The Hedy Lamarr Story' presents a surprising picture of a screen star

E6 | Friday, March 9, 2018 | SFCHRONICLE.COM

MOVIE REVIEWS

Revealing look at Hedy Lamarr

By Mick LaSalle

Bombshell: The Hedy Lamarr Story

Documentary. Starring Hedy Lamarr. Directed by Alexandra Dean. (Unrated, 90 minutes.)



Reuters 1949

Actress Hedy Lamarr invented "frequency hopping" communications technology that's still in use today.

[The 1949 photo is from Samson and Delilah]

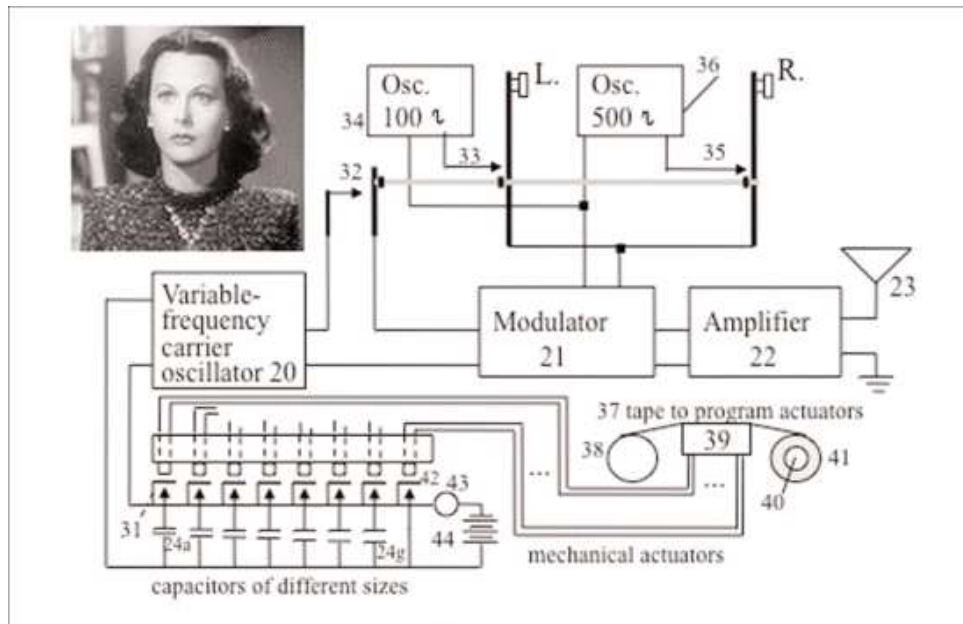
Many people thought that the actress Hedy Lamarr was the most beautiful woman in the world. But even today, her mind impresses. She invented spread-spectrum radio (now used universally, *e.g.*, in cell phones). She wanted to defeat the Nazis, from whom she had escaped. She thought that an unjammable guided torpedo would help, so she invented just such a system in World War Two. The Navy put it into service by the time of the Cuban Missile crises, in the early 1960s.

In Lamarr's system, the transmitter changed frequencies following a musical pattern, say one of Bach's Two- and Three- Part Inventions. The torpedo receiver was programmed with that same piece, at the same tempo, and switched its receive frequencies in accord. Any jammer would have a hard time finding any of the frequencies, and could not know the preset pattern of variation. BOOM! goes the enemy vessel!

IEEE says, “ ... the predecessor of another application, OFDM^[2]-based frequency-hopping systems, was a 1942 patent of Hedy Kiesler Markey, better known as the film star Hedy Lamarr. The objective, during World War II, was a jam-resistant communication channel for guiding torpedoes, and Lamarr's solution was random movement among frequency channels that would thwart the narrowband jamming systems. Although the system of [the figure below] used a tunable hardware oscillator rather than a DFT, it illustrated one more motivation for generating a signal utilizing many subchannels rather than a single-carrier system.

² “Orthogonal frequency-division multiplexing (**OFDM**) is a method of digital signal modulation in which a single data stream is split across several separate narrowband channels at different frequencies to reduce interference and crosstalk.” (... to quote the wiki).

IEEE Figure 15. [Hedy Lamarr's Patent 2292387]



[IEEE:] “Part of the figure from the frequency hopping system coinvented by Hedy Lamarr (photo).”

“The concept of frequency hopping is now a popular spread spectrum technique for avoiding interference if not outright jamming. It was notably implemented in the Bluetooth standard (IEEE 802.15.1). More recently, it appeared in the context of cellular mobile communications in the Flarion Flash OFDM system, now a product of Qualcomm, which uses fast hopping among the OFDM subbands to provide flexibility to accommodate different classes of IP (Internet Protocol) traffic, and to minimize interference between mobile units on either side of a cell boundary.”³

³ <http://ieeexplore.ieee.org/document/5307460/> [fns omitted] “The history of orthogonal frequency- division multiplexing [History of Communications]” IEEE Communications Magazine, Volume: 47 Issue: 11, <http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=35>

== ==

One way to understand Hedy Lamarr's (primitive but novel) system is as a "voter." Any jammed signal's modulation did not get through, but the unjammed signals did, and the receiver voted for them because they had the right modulation. The frequency hopping was needed to provide candidates for voting. The delay in the receiver relative to the alacrity of the transmitter's hopping in effect integrated the command as either right or left (or steady -as -she -goes).

Denny Monticelli has noted that there's a lot more to digital communications than frequency hopping. IEEE also says FDM goes back to the 19th Century in telegraph and analog telephone systems.

The popular press, as one may have noticed, sometimes gets things wrong. The film reviews say Hedy failed to renew her patent so it lapsed. But a patent is for 17 years and that's it, nonrenewable. (Copyrights are renewable). The Xerox strategy could work: just keep piling one improvement patent on another, forever. But Hedy Lamarr was not Xerox.

Some say that Hedy Lamarr was not a great professional role model. The current prejudice is that if an artist (or any other public person) has ever done something deplorable, we must consign their art or work to oblivion. Better the notions of the [once] "New Criticism": art speaks for itself. She was smart, gutsy and beautiful, and she hated Nazis, so what's not to like?



Hedy Lamarr in 1941

++

A Biography of Hedy Lamarr

A biography prepared in honor of Hedy Lamarr's birthday, November 9th, compiled by John L. DeRycke, W2JLD, KD2HWN, appearing on www.QRZ.com, used by permission



1. Hedwig Eva Maria Kiesler was born 9 November 1914 in Vienna, Austria-Hungary.
2. She is the only child of Gertrud “Trude” Kiesler and Emil Kiesler.
3. Her father was born to a Jewish family in Lemberg (now Lviv in Ukraine) and was a successful bank director.
4. Her mother was a pianist and Budapest native who came from an upper-class Jewish family; she had converted from Judaism to Catholicism and was described as a “practicing Christian,” who raised her daughter as a Christian.
5. Lamarr helped get her mother out of Austria (then under Nazi domination) and to the United States. Her mother later became a United States citizen.
6. Gertrud Kiesler put “Hebrew” as her race on her petition for naturalization as a United States citizen. She would live out the rest of her life in California, dying in 1977 at age 83.
7. In the late 1920s, Lamarr was discovered as an actress and brought to Berlin by producer Max Reinhardt. Following her training in the theater, she returned to Vienna, where she began to work in the film industry, first as a script girl, and soon as an actress.
8. In early 1933, at age 18, she starred in Gustav Machaty’s film, *Ecstasy* (*Ekstase* in German, *Extase* in Czech), which was filmed in Prague, Czechoslovakia. Lamarr’s role was that of a neglected young wife married to an indifferent older man. The film became notorious for showing Lamarr’s face in the throes of orgasm as well as close-up and brief nude scenes in which she is seen swimming and running through the woods.

9. On 10 August 1933, Lamarr married Friedrich Mandl, an Austrian military arms merchant and munitions manufacturer who was reputedly the third-richest man in Austria.

10. Lamarr was 18 years old and Mandl was 33. In her autobiography *Ecstasy and Me*, Lamarr described Mandl as an extremely controlling husband who strongly objected to her simulated orgasm scene in *Ecstasy*, and prevented her from pursuing her acting career.

11. Lamarr claimed she was kept a virtual prisoner in their castle home, Schloss Schwarzenau.

12. Mandl had close social and business ties to the fascist government of Italy, selling munitions to Mussolini and, although his father was Jewish, he had ties to the Nazi government of Germany as well.

13. Lamarr wrote that Mussolini and Hitler attended lavish parties at the Mandl home. Lamarr accompanied Mandl to business meetings, where he conferred with scientists and other professionals involved in military technology. These conferences were her introduction to the field of applied science and the bedrock that nurtured her latent talent in science.

14. Lamarr's marriage to Mandl eventually became unbearable, and she decided to separate herself from both him and her country.

15. In her autobiography, she wrote that she disguised herself as her maid and fled to Paris; but by other accounts, she persuaded Mandl to let her wear all of her jewelry for a dinner party, then disappeared afterward.

16. After arriving in Paris in 1937, she met Louis B. Mayer, who was scouting for talent in Europe. Mayer persuaded her to change her name to Hedy Lamarr (she had been known as "the Ecstasy lady"), choosing the surname in homage to the beautiful silent film star, Barbara La Marr.

17. He brought her to Hollywood in 1938, and began promoting her as the “world’s most beautiful woman.”

18. Lamarr made her American film debut in *Algiers* (1938), opposite Charles Boyer. The film created a “national sensation,” says Shearer.

19. She was billed as an unknown but well-publicized Austrian actress, which created anticipation in audiences. Mayer hoped she would become another Greta Garbo or Marlene Dietrich. According to one viewer, when her face first appeared on the screen, “everyone gasped ... Lamarr’s beauty literally took one’s breath away.”

20. In future Hollywood films, she was invariably typecast as the archetypal, glamorous seductress of exotic origin. Lamarr played opposite the era’s most popular leading men.

21. Her many films included *Boom Town* (1940) with Clark Gable and Spencer Tracy; *Comrade X* with Gable; *White Cargo* (1942), *Tortilla Flat* (1942) with Tracy and John Garfield; *H. M. Pulham, Esq.* (1941) with Robert Young; and *Dishonored Lady* (1947). In 1941, Lamarr was cast alongside Lana Turner and Judy Garland in *Ziegfeld Girl*.

22. Lamarr made 18 films from 1940 to 1949, and also had two children during that time (in 1945 and 1947).

23. After leaving MGM in 1945, she enjoyed her biggest success as Delilah in Cecil B. DeMille’s *Samson and Delilah*, the highest-grossing film of 1949, with Victor Mature as the Biblical strongman.

25. However, following a comedic role opposite Bob Hope in *My Favorite Spy* (1951), her career went into decline. She appeared only sporadically in films after 1950, one of her last roles being that of Joan of Arc in Irwin Allen’s critically panned epic, *The Story of Mankind* (1957).

26. *White Cargo*, one of Lamarr's biggest hits at MGM, contains arguably her most memorable film quote, delivered with provocative invitation: "I am Tondelayo. I make tiffin for you?" This line typifies many of Lamarr's roles, which emphasized her beauty and sexuality, while giving her relatively few lines.

27. The lack of acting challenges bored Lamarr. She reportedly took up inventing to relieve her boredom.

28. Lamarr's earliest inventions included an improved traffic stoplight and a tablet that would dissolve in water to create a carbonated drink. The beverage was unsuccessful; Lamarr herself said it tasted like Alka-Seltzer.

29. With the ongoing World War, Lamarr was inspired to contribute to the war effort, designing a jam-proof radio guidance system for torpedoes. With the help of composer George Antheil, they drafted designs for a new frequency-hopping, spread-spectrum technology that they later patented.

30. Lamarr and Antheil realized that radio-controlled torpedoes, which could be important in the naval war, could easily be jammed, thereby causing the torpedo to go off course.

31. With the knowledge she had gained about torpedoes from her first husband, and using a method similar to the way piano rolls work, they designed a frequency-hopping system that would continually change the radio signals sent to the torpedo.

32. Their invention was granted a patent on 11 August 1942 (filed using her married name Hedy Kiesler Markey). Yet, it was technologically difficult to implement, and at that time the U.S. Navy was not receptive to considering inventions coming from outside the military.

33. Only in 1962 (at the time of the Cuban missile crisis) did an updated version of their design appear on Navy ships. The design is one of the important elements behind today's spread-spectrum communication technology, such as modern ... networks, and Bluetooth technology.

34. In 1997, they received the Electronic Frontier Foundation Pioneer Award and the Bulbie[™] Gnass Spirit of Achievement Bronze Award, given to individuals whose creative lifetime achievements in the arts, sciences, business, or invention fields have significantly contributed to society.

35. She was featured on the Science Channel and the Discovery Channel.

36. In 2014, Lamarr and Antheil were posthumously inducted into the National Inventors Hall of Fame.

37. Lamarr became a naturalized citizen of the United States at age 38 on 10 April 1953.

38. In 1966, she was arrested in Los Angeles for shoplifting. The charges were eventually dropped.

39. In 1991, she was arrested on the same charge in Florida, this time for stealing \$21.48 worth of laxatives and eye drops. She pleaded "no contest" to avoid a court appearance, and the charges were once again dropped in return for a promise to refrain from breaking any laws for a year.

40. Her autobiography, *Ecstasy and Me*, was published in 1966. However, she said on TV that it was not actually written by her, implying that much of it was fictional.

41. According to the book, she slipped into a brothel and hid in an empty room while fleeing her estranged husband, Fritz Mandl. While her

husband searched the brothel, a man entered the room and she had sex with him so she could remain unrecognized. She escaped by hiring a maid who resembled her, she drugged the maid and used her uniform as a disguise to escape.

42. Lamarr later sued the publisher, saying that many of the anecdotes in the book, which was described by a judge as “filthy, nauseating, and revolting,” were fabricated by its ghost writer, Leo Guild. She was also sued in Federal Court by Gene Ringgold, who asserted the actress’s autobiography contained material from an article about her life which he wrote in 1965 for a magazine called Screen Facts.

43. The publication of her autobiography took place about a year after the accusations of shoplifting and a year after Andy Warhol’s short film *Hedy* (1966). The shoplifting charges coincided with a failed attempt to return to the screen in *Picture Mommy Dead* (1966). The role was ultimately filled by Zsa Zsa Gabor.

44. The 1970s was a decade of increasing seclusion for Lamarr. She was offered several scripts, television commercials, and stage projects, but none piqued her interest.

45. In 1974, she filed a \$10-million lawsuit against Warner Bros., claiming that the running parody of her name (“Hedley Lamarr”) in the Mel Brooks’ comedy *Blazing Saddles* infringed her right to privacy.

46. Brooks said he was flattered. The studio settled out of court for an undisclosed nominal sum and an apology to Lamarr for “almost using her name.” Brooks said that Lamarr “never got the joke.”

47. With failing eyesight, she retreated from public life and settled in Miami Beach, Florida, in 1981.

48. For several years beginning in 1997, the boxes of CorelDRAW’s software suites were graced by a large Corel-drawn image of Lamarr.

The picture won CorelDRAW's yearly software suite cover design contest in 1996. Lamarr sued Corel for using the image without her permission. Corel countered that she did not own rights to the image. The parties reached an undisclosed settlement in 1998.

49. For her contribution to the motion picture industry, Lamarr has a star on the Hollywood Walk of Fame at 6247 Hollywood Blvd adjacent to Vine St where the Walk is centered.

50. In her later years, Lamarr turned to plastic surgery to preserve the looks she was terrified of losing. Lamarr had to endure disastrous results. "She had her breasts enlarged, her cheeks raised, her lips made bigger, and much, much more" said her son, Anthony. "She had plastic surgery thinking it could revive her looks and her career, but it backfired and distorted her beauty." Anthony Loder also claimed that Lamarr was addicted to pills.

51. Lamarr became estranged from her adopted son, James Lamarr Loder, when he was 12 years old. Their relationship ended abruptly and he moved in with another family. They did not speak again for almost 50 years. Lamarr left James Loder out of her will and he sued for control of the US \$3.3 million estate left by Lamarr in 2000.

52. Lamarr was married and divorced six times. She adopted a son, James, in 1941, during her second marriage to Gene Markey. She went on to have two biological children, Denise (born 1945) and Anthony (born 1947), with her third husband, actor John Loder, who also adopted James.

53. The following is a list of her marriages:

Friedrich Mandl (married 1933-1937), chairman of the Hirtenberger Patronen-Fabrik.

Gene Markey (married 1939-1941), screenwriter and producer. Child: James Lamarr Markey (born 9 January 1939), adopted 12 June 1939, and re-adopted by John Loder; the child was thereafter known as James Lamarr Loder. The couple lived at 2727 Benedict Canyon Drive in Beverly Hills, California during their marriage.

John Loder (married 1943-1947), actor. Children: Denise Loder (born 19 January 1945), married Larry Colton, a writer and former baseball player, and Anthony Loder (born 1 February 1947), married Roxanne who worked for illustrator James McMullan. Anthony Loder was featured in the 2004 documentary film Calling Hedy Lamarr.

Ernest “Ted” Stauffer (married 1951-1952), nightclub owner, restaurateur, and former bandleader.

W. Howard Lee (married 1953-1960); a Texas oilman (who later married film actress Gene Tierney).

Lewis J. Boies (married 1963-1965); Lamarr’s own divorce lawyer.

54. Following her sixth and final divorce in 1965, Lamarr remained single for the last 35 years of her life.

55. Lamarr died in Casselberry, Florida, on 19 January 2000, aged 85.

56. Her death certificate cited three causes: heart failure, chronic valvular heart disease, and arteriosclerotic heart disease.

57. Her death coincided with her daughter Denise’s 55th birthday. Her son Anthony Loder took her ashes to Austria and spread them in the Vienna Woods, in accordance with her last wishes.

58. Lamarr was given an honorary grave in Vienna’s Central Cemetery in 2014.

##