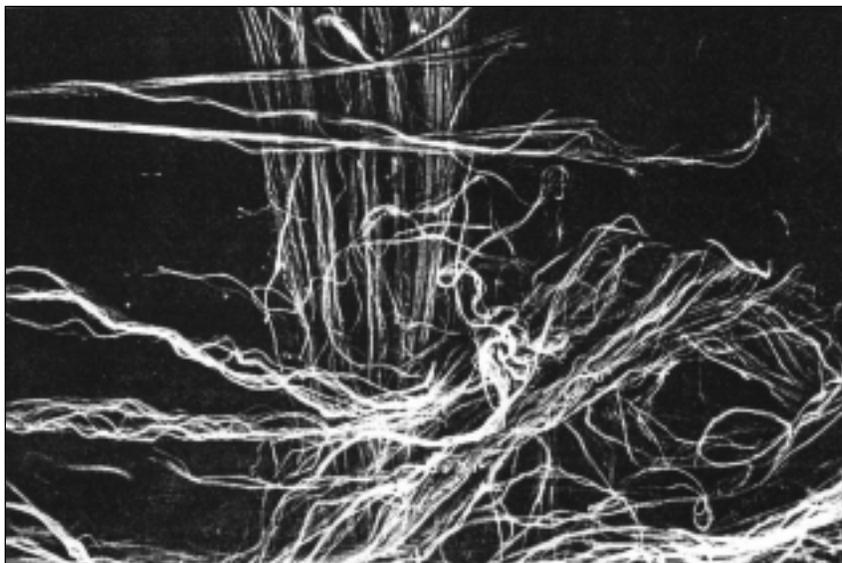


AN ANALYSIS OF ANGEL HAIR 1947–2000



At 2:00 p.m. on October 22, 1973, in Sudbury, Massachusetts, a child ran into the house calling to his mother to come outside to see “the biggest spiderweb in the world.” The mother discovered in her yard a silvery-white web-like material covering bushes and hanging from the trees. As she looked toward the sky, she witnessed a shiny, silvery, spherical object moving off to the west as more of this web-like substance fell from the sky for another two hours. The witness took samples on construction paper and placed them in a glass jar and into the refrigerator taking them to a local laboratory for examination. The material was white and translucent and diminishing rapidly. This is a microscopic photo of the substance.

(NICAP, UFO Investigator, March 1974)



AN ANALYSIS OF ANGEL HAIR, 1947–2000

BY BRIAN BOLDMAN

The fall of odd, gossamer-like material from the sky has been reported many times, sometimes in association with UFOs, sometimes not. Its origin is mysterious, and because it comes from the sky, it has been labeled “angel hair.” The fall of such material is often considered to be a part of the UFO phenomenon, specifically a close encounter of the second kind, or a case that involves physical evidence or some interaction with the environment. I will show in this article that angel hair, while rare, is indeed a genuine constituent of the UFO phenomenon and worthy of further study. To quote NASA scientist Paul Hill in his book *Unconventional Flying Objects*:

A consistent pattern of refuse, as determined and documented by the civilian UFO investigating agencies, is the ejection of a fine, white, translucent filament that has come to be known as angel hair. No investigation of this substance commensurate with its potential importance has ever been made.¹

An extensive literature survey turned up 255 cases of angel hair falls from 679 to 2001. This article will focus on 215 cases from 1947 to 2000. While this is not a huge sample, every effort has been made to uncover all possible cases, so that there is no selection bias. The data are assumed to be representative of the phenomenon.

CLASSIC CASES

While not all angel hair falls involve UFO sightings, there have been several recent high-quality cases with multiple witnesses reminiscent of the 1952 French cases of Oloron and Gaillac, written about by Aimé Michel and others.

One such case occurred in Quirindi, New South Wales, Australia, on August 10, 1998. In the afternoon, Mrs. Eunice Stansfield, her daughter, and her son-in-law wit-

Brian Boldman is an FAA licensed Private Pilot and Aircraft Mechanic. After a UFO sighting in 1989, he began more than a decade of research into the UFO phenomenon, concluding that physical trace cases, such as angel hair, might provide the best evidence for the reality of UFOs.

nessed “cobwebs” falling from the clear blue sky along with silver spheres that were performing aerobatic maneuvers. They were described as “a bright metallic grey” and about 2–3 inches at arm’s length. At one time as many as 20 were in view. They could stop and hover, or perform rapid right-angle turns.

UFO CLAIMS: Residents of a small Australian community swear that they saw cobwebs fall from the sky after UFOs passed overhead. Dozens of residents of Quirindi called Australia's National UFO hot line after the incident. FELL 8/10/98 USA TODAY 8/11/98 9A

The production of the “exhaust” or angel hair took place during accelerations or rapid maneuvers; when some of the objects maneuvered and increased speed, this cobweb-like substance started to drop to the ground. Some of it got caught on the telephone lines.² It was described as white and strong like cotton, but it dissolved away to nothing while they handled it.³

These are all classic properties of angel-hair cases, where silver spheres, disks, or cigars are seen discharging a substance, usually on dry, clear, fall days. The substance hangs on branches, wires, fences—anything that can catch it—and then just sublimates away to nothing over a period of hours.

What are the characteristics of angel hair? Angel hair can be described as a fibrous, web- or silk-like substance that descends to earth and is notable due to UFOs being reported concurrently in over half of these cases. It may be fine or coarse. Vast quantities covering many square miles have been reported, sometimes draping over utility lines for miles on end. Unusual physical properties are also widely reported, such as *sublimation*, or the change of state of a substance directly from a solid to a gas, bypassing the liquid state. I will discuss this in some detail as it is reported in a large percentage of angel-hair cases.

Angel hair is usually described as pure white, but it can also be various shades of gray, silver, or translucent. In a few rare cases it has been reported as streaked with gray, or even black. No odor has been reported except for a camphor-like smell in a few cases. In several instances where it

has been tasted, (not recommended) it was described as salty. It has also been reported as extremely tough and hard to break, followed by complete sublimation. Certainly these features appear to be contradictory, but that is what is reported.

Reports of angel hair have been exceedingly rare during the past few decades, but trace cases and UFO reports in general also declined. However, this seems to be changing. There have been at least a dozen angel-hair cases in recent years, and while this is a paltry number when compared to the number of UFO reports, CE2 events involving angel hair cannot be dismissed as illusory. Witnesses widely separated both temporally and geographically have reported exactly the same properties of the substance; additionally, angel hair is rare enough that it is doubtful that multiple witnesses would concoct and stick by the same story to create a hoax. On top of this, witnesses have recovered samples of this material that is tangible physical evidence, albeit ephemeral, that can be tested in a lab—and has been in a few cases.

Like the UFO phenomenon, there is undoubtedly no single causative factor for angel-hair falls. But the evidence for a genuine phenomenon is mounting. Fifty-seven percent of angel-hair cases involve UFO reports, a significant number, which strongly links the two phenomena.

ANGEL-HAIR UFOs

The most commonly reported UFO varieties associated with angel-hair falls are consistent with classic types, such as disks, globes, and cigars. More recent types, such as triangles, are rare, as are nocturnal-light cases. There are generally no sounds or odors associated with the falls. UFO colors reported in descending prominence are: silver, white, gray, silver-white, black, and a scattering of orange, blue, and red. Commonly the UFO is described as reflective, shiny, silvery, or bright.

Out of 215 cases, 72 have descriptions capable of being categorized. In the case of angel-hair UFOs, almost all are daylight sightings. The only exceptions in the following table are in the other category, which includes a few daytime “jellyfish” or “tadpole” types; the rest are nocturnal lights.

| UFO Types Associated with Angel Hair—72 cases | |
|---|----------------|
| Disks / Saucers | 32 cases (44%) |
| Globes / Spheres | 21 cases (29%) |
| Cigars | 10 cases (14%) |
| Other | 9 cases (12%) |

TIMES OF FALLS

Fifty-nine cases have information on the time when the fall began, and some of these include the total duration of the fall. In 16 cases where the beginning and ending of the fall

was noted, fall times ranged from 1 hour to 11 hours, with the average length of fall being 3 hours. The data indicate that angel hair is mainly an afternoon phenomenon, with a peak time between 1300 and 1400 hours. The beginning time of falls where that was reported is summarized in the following table. Note that fully one-quarter of the cases began between noon and 2 p.m. local time.

| Angel-Hair Fall Times (Local time) | |
|------------------------------------|----------------|
| <i>Local fall starts</i> | |
| 6 a.m.–12 noon | 8 cases (14%) |
| 12:01–6:00 p.m. | 37 cases (65%) |
| 12:01–2:00 p.m. | 14 cases (25%) |
| Average start time | 1:45 p.m. |

WEATHER

Basic weather data was obtained from the National Climatic Data Center in Asheville, North Carolina, in the form of Local Climatological Data (LCD) sheets published by the U.S. Department of Commerce. Each LCD is comprised of a month of observations broken down to daily and hourly observations at any of 290 National Weather Service stations. However, to obtain complete weather data for all U.S. angel-hair cases would require the purchase of multiple data sets at a prohibitive cost.

I visited the NCDC Archives in Asheville in order to obtain LCD photocopies at a more reasonable cost, as well as foreign weather data. The results were somewhat disappointing, as not all U.S. records were available, and foreign daily data were almost impossible to obtain. Weather data was obtained for 54 U.S. cases, but due to differing formats, not all parameters are available for all cases.

Due to the limited number of hourly observations available, some of the weather data can only be presented in a general sense, and is therefore of limited value. Relative humidity was available for only 15 cases. The values ranged from 23% to 71%. Twelve cases (80%) had a relative humidity less than 50%, and the average of all 15 is 40%.

Total precipitation for all 54 cases was 1.48 inches; that is, on those 54 days the total *sum* of all precipitation was 1.48 inches. This is not very much, and the figure is further skewed by a single case where 1.27 inches fell. With this report removed, the total precipitation for 53 cases is a scant

| Angel-Hair Weather | |
|-----------------------|----------|
| Average Temp. | 58° F. |
| Max. Temp | 86° F. |
| Min. Temp | 19° F. |
| Average Precipitation | .04" |
| Average Humidity | 40% |
| Average Wind Speed | 6.86 mph |
| Peak Wind Speed | 30 mph |
| Average Cloud Cover | 2/10 |

0.21 inches, which means that angel hair essentially occurs during dry weather patterns.

Cloud-cover data indicates sunny days were much more common during angel-hair falls. The data for cloud cover is recorded in tenths. A full 56% of cases had cloud-free skies; the remaining cases were split, with 1/10 to 5/10 cloud cover in 22%, and 6/10 to 10/10 cover in another 22%. Average cloud cover is about 2/10, consistent with the precipitation data.

Perhaps the most important weather data is the percentage of cloudless days, indicative of a high temperature dewpoint spread and low relative humidity. More work needs to be done here, and the data can only be presented on a preliminary and general basis, but there is enough to show a general trend of low humidity during angel-hair days.

ANGEL-HAIR THEORIES

The most prominent theory for angel hair by far is that it is nothing but the discarded webs of ballooning spiders, or “gossamer.” Young spiders emit strands of silk that have enough drag that rising air currents pull them aloft. These spiders can rise to thousands of feet in altitude and travel vast distances. Ballooning spiders have been known to alight on ships hundreds of miles from land.

Ballooning is done for a variety of reasons. As young spiderlings hatch, population densities soar, and young spiders may soar to escape overcrowding. Ballooning is also done to escape predation or adverse environmental conditions. Angel hair is most commonly blamed on sheet-web weavers (Subfamily Linyphiinae), but crab spiders (Family Thomisidae) and others are also known to balloon. Spiders balloon most often on clear, fall days due to the rapid rise in surface temperatures generating convective currents conducive to ballooning. Angel hair is also most prominent on these days, and this is why spiders usually take the rap. However, a closer look at the data will show that a jump to this conclusion is premature.

Spider silk is an albuminoid protein, made up of the amino acids glycine, alanine, glutamine, leucine, and tyrosine, and it is one of the strongest natural fibers known to man. It is five times stronger than steel of the same diameter, but can be stretched over 130% of its normal length. Spider silk is even being studied in the hope that materials stronger than Kevlar can be developed for the manufacture of more protective bullet-proof vests and parachute shroud lines. In the South Pacific, raw web silk is used to make fishing nets and bird snares.

This brings to the fore problems with the spider-web theory. It seems that a material with such characteristics would hardly sublime (dissolve away) as reported. And imagine the chagrin of the poor arachnids that would never complete their webs as they sublimated out from under them!

Is it possible that spider web could be responsible for *some* angel hair cases? During the July 1968 *Symposium on*

Unidentified Flying Objects before the U.S. House of Representatives, Dr. Robert M. L. Baker testified that:

Certain soaring insects—notably “ballooning spiders”—produce bright-moving points of light. The author has witnessed such a phenomenon. It is produced by Sun reflections off the streamers of silken threads spun by many types of spiders. Caught by the wind, these streamers serve as a means of locomotion floating the spider high into the air. They occasionally have the appearance of vast numbers of silken flakes which fill the air and in some recorded instances extend over many square miles and to a height of several hundred feet. . . . Thus the images might be attributed to ballooning spiders at distances of 50 to 100 feet. However, these web reflections ordinarily show up only against a rather dark background and it is doubted if their intensity would be great enough to produce the intense UFO images against a bright sky.⁴

From this statement it seems obvious that Dr. Baker is describing the quick glint that everyone has seen of the sun being reflected off spider web. Could UFOs be attributed to such an obvious and common phenomenon in a high percentage of cases? This author maintains that while this may be responsible for a few cases, most witnesses are able to differentiate between the two. The weather data also points against this theory, as over half of the cases with data available occurred during bright, clear skies with low humidity, meaning that visibility was good.

It is certainly possible that a more unusual, but still prosaic, web structure might be responsible for some cases. Rather than single strands, or even multiple strands that under ordinary circumstances would be readily identified, perhaps statically charged webs could adhere while airborne to form a mass that might easily be mistaken for a shimmering, silent, hovering UFO. This could also explain the witness reports of the “ejection” of angel hair as the static charge leaked away.

So yes, it seems possible that *some* angel hair cases *might* be attributable to spider web, but there are problems with this theory that will become more apparent later. For now, let us wonder what the stimulus might be to cause UFO reports in 123 out of 215 cases (57%).

OTHER THEORIES

Angel hair has been blamed on a plethora of materials, from natural fibers to industrial residues. Cotton, milkweed, nylon, fiberglass or glass wool, rayon, or radar chaff have all been suggested. It has even been proposed that angel hair is the product of an alien waste dump! One of the earliest theories hypothesized that angel hair was atmospheric dust linked by a static charge. As the charge dissipated, so did the angel hair, which also explained its sublimation.

Another popular theory involves the polymerization of nitrogen and oxygen in strong electromagnetic fields sur-

rounding UFOs. The bonds in these long chain polymers would be unstable, causing the apparent sublimation. In *The Truth About Flying Saucers*, Aimé Michel writes about the theories of French Air Force Lieutenant Jean Plantier:

For, according to Plantier, the ionization of the atmosphere in the wake of the craft would be sufficient (because of the colossal intensity of the field) to produce ultra-heavy positive particles, which in contact with the molecules of oxygen, nitrogen, water, etc., of the surrounding air would exhibit novel chemical reactions. The product of these reactions—the famous angels' hair—would disintegrate as the ionization disappeared.⁵

The production of angel hair has been equated with the manufacture of cotton candy. Cotton candy is made by introducing molten sugar into a centrifuge, where it is extruded through small openings into the common wispy filaments that solidify on contact with air. The actual generation of angel hair is not known, but scientific analysis may provide clues.

EARLY ANALYSIS

Angel hair has baffled many that have tried to analyze it. Entomologists say it's a fiber, but then the same sample is examined by a fiber technician who says, no, it's spider web. And sometimes the sample sublimates before any analysis can be done. Here are a few examples of head-scratchers:

- "Many witnesses picked up the fragments of material, which resembled silvery filaments clinging together like cobwebs, and "wilted away" when handled. A sample was taken to the police, and a chemist in Graulhet tried to analyze it, but without success."⁶

- "The results of analysis by several different professional people are strangely contradictory. It is a significant fact that none of the scientists identified the material as the web of a ballooning spider."⁷

- "Six scientists of the Australian Commonwealth Scientific and Industrial Organization have studied the threads . . . as the threads have a melting quality, they are further puzzled."⁸

- "A fiber technician with Burlington Industries tested a sample of the 'angel hair' and said it was not cotton, wool, or any commercial synthetic yarn. He suggested that it might be spider webs or a similar animal material. But a Greensboro biologist examined a sample of the 'angel hair' under a microscope and said it was 'unlikely' that it was spider webs."⁹

- "WSAV-TV gathered some of the silken threads and took them to the state crime laboratory. Toxicologist Charles H. Sullenger stared at them through a microscope and ran several tests on them. Then he announced he didn't know what they were either."¹⁰

It is interesting that in multiple cases, widespread in

time and location, the same elements were detected: silicon, calcium, magnesium, and boron. Angel hair has been called borosilicate glass due to these constituents.

- October 1953, Victoria, Australia. ". . . a sample was recovered and made available for laboratory analysis. The examination revealed that the substance consisted of a nylon-like amorphous mass with traces of magnesium, calcium, boron and silicon. Since then the original material, which was kept in an air-tight container shrank from three to a mere half-inch without residue."¹¹

- October 27, 1954, Florence, Italy. "Engineering student Alfredo Jacopozzi collected samples in a jar and took it to Professor Cozzi at the Institute of Chemistry at the University of Florence for analysis . . . the substance contained such known elements as boron, silicon, magnesium and calcium."¹²

- January 17, 1963, Entre Ríos province, Argentina. ". . . a formation passed over Entre Ríos, and observers recovered vitreous particles that had fallen from them . . . these particles were found to be an amalgam of silicon, boron, calcium, and magnesium, just the same as has been found in similar circumstances in other parts of the world."¹³

While silicon, calcium, and magnesium are common elements in the earth's crust, boron is not. It constitutes only 3–10 parts per million of the crust, making it relatively rare. Why it should turn up in these samples from three different continents years apart is unknown. Boron absorbs neutrons and is used to shield and control nuclear reactions, adding to the speculation that angel hair is a by-product of a nuclear propulsion system. (An interesting aside involves J. Allen Hynek's infamous March 1966 "swamp gas" case at Hillsdale College, Michigan. Analysis of the landing site showed radiation levels higher than the surrounding area, and the ground was contaminated with boron.)

Other elements found in angel hair include potassium, silicon, calcium, phosphorus, aluminum, oxygen, chlorine, iron, sulphur, manganese potassium, sodium, zinc, lanthanum, cesium, and tritium.

The tritium content is particularly interesting. It was found in an angel hair sample recovered in Sonora, California, on October 12, 1976. Tritium is a radioactive isotope of hydrogen, and is rare in nature. Tritium gas is used to boost the yield of nuclear warheads; to obtain tritium in any appreciable amount it must be man-made in nuclear reactors or particle accelerators. What this stuff was doing in angel hair is open to speculation, but to keep this in perspective, there have only been a handful of cases where angel hair has been reported as radioactive, and there is probably a more prosaic explanation.

In particular, a possible explanation for radioactive angel hair may be nuclear testing. For instance, on February 21, 1955, white, fibrous angel hair covered a half-square mile in Horseheads, New York (see clipping on the next page, source unknown). It was described as "badly damaged" radioactive cotton fiber that was impregnated with dirt, had no odor, did not burn rapidly, and was rapidly



disintegrating and disappearing. No one blamed this fall on spiders.

On February 18, 1955, Operation Teapot had performed the test codenamed Wasp at the Nevada Test Site, Area 7. This was an airdrop that yielded 1.2 kilotons, but it seems unlikely that debris from Nevada would wind up in New York State. The caption reads in part "... the angel hair was identified as waste products from the local milk plant." This explanation would hardly seem to account for the radiation.

PROBLEMS WITH ANALYSES

There are numerous cases in the literature where angel hair was not even examined, it was just *assumed* to be spider web. A classic example of this occurred on October 8, 1969, in St. Louis, Missouri, when a vast area covering most of the city was blanketed by a pure white, sticky substance ranging from dime-size to 10-foot long streamers. The majority of it sublimated on ground contact. Despite the fact that only a *single spider* was found, the Smithsonian Institution's Center for Short-Lived Phenomena concluded the causative factor was ballooning spiders. When a sample was tested by Dr. Wayne E. Black of the St. Louis County Health Department, he concluded:

A "ballooning spider" phenomenon does exist; however, it is doubtful that this was the case in this particular instance. Laboratory tests on the fiber-like material were negative for protein which is the basic chemical composition of spider webbing.¹⁴

Another example of this occurred in October of 1957, when huge quantities of a web-like substance fell over a wide area of New Mexico. Strands as long as 50 feet covered an area from Portales to Hobbs, a distance of 110 miles. The Portales *News-Tribune* reported:

Eventually, however, "Dr. William Kister, University of New Mexico biologist, offered the spider-web explanation tentatively, without examining the material . . . and this was accepted as the solution of the mystery."¹⁵

The most obvious problem with doing any analysis is that angel hair is known to sublime, sometimes within minutes, making an analysis impossible unless a sample is stored in an airtight container. In that case, gas chromatography can be used if the container is kept sealed. As in Quirindi, there are other cases where witnesses have added additional web material at a later time, after the original

sample sublimates. This leads to the conclusion that the substance is spider web, sometimes with "contaminants."

Conversely, if true angel hair landed on spider web, and then both were collected together, the same result could occur. This may have happened with a sample collected in Midway, Texas, on October 23, 1973. This sample was analyzed by students at the University of Texas, Austin, and found to be consistent with *Dictyna* spider web. This genus of cribellate spiders does not spin a two-dimensional orb web, but rather the mass-type three-dimensional web, which would be more likely confused with angel hair. However, the sample did have some unusual constituents, including zinc and the rare-earth element lanthanum, which are never web constituents. It was theorized that the witness *could* have witnessed a genuine angel-hair fall, and then collected the largest mass available, angel hair *and* the cribellate web.

Even if the sample was not contaminated, knowing only the elemental constituents is not enough to tell us what angel hair is. Paul Hill writes:

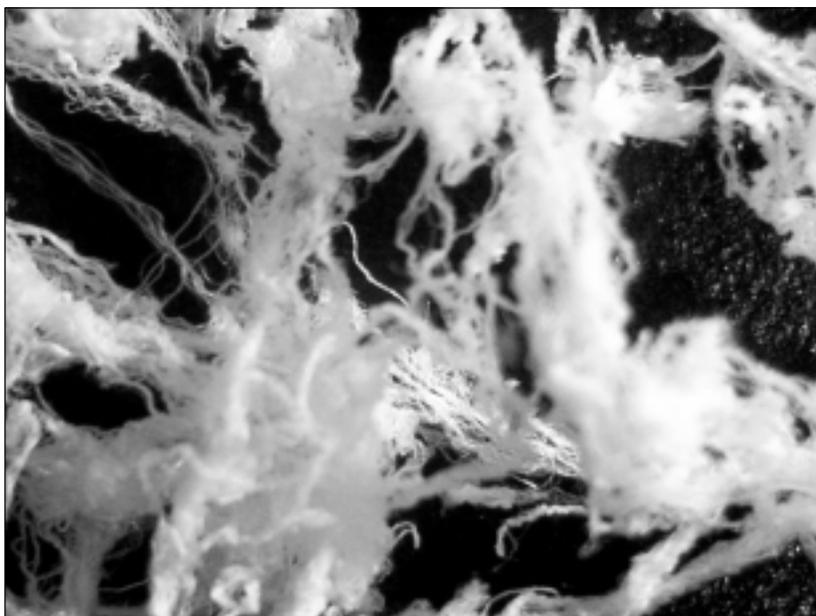
When we know, or suspect, that a substance is a complicated molecular compound, it is very little knowledge to know that some of the atomic constituents are boron, silicon, calcium, and magnesium. If this analysis were valid, angel hair would resemble fine wire and would not sublime at ambient temperatures. Among other things, the negative-valence atoms are missing from this formulation. What is needed is an analysis of the molecular composition, so that we will know the molecular compounds which form angel hair.¹⁶

We now have a contemporary analysis that can shed light on the molecular composition of angel hair. Phyllis Budinger of Frontier Analysis Ltd., a very skilled analytical scientist with the capability to do Fourier Transform Infrared Spectrometry (FT-IR) with a Nicolet Avatar 360 spectrometer, and Gas Chromatography/Mass Spectrometry (GC/MS), completed this work. Here are her results from a sample recovered in Sacramento, California, on November 11, 1999:

The "angel hair" consists of fibrous material with protein amide type linkages showing it is from an animal/biological source. The data (FT-IR) compare closest to references of silk. *It is definitely not from cobwebs.* [emphasis added]

The fibers also have small amounts of an ester type material and other components on the surface. An attempt is in progress to further identify them. There are also *volatiles* associated with the angel hair. So far light branched hydrocarbons have been identified (GC/MS). Another test is being done (FT-IR over time) to determine if there are other volatiles. Some current spectra indicate there are.

They consisted of: 2-methyl propane; 2-methyl-1-propene; 2-methyl-1-butene; 2-methyl pentane; 3-methyl pentane; hexane; dimethyl-pentane; 2 C₆H₁₂ (molecular weight=84) hydrocarbon structures (specific



Above: Microscope photograph (60×) of the 1999 Sacramento angel hair (below). (Photos courtesy of Phyllis Budinger)

isomers unidentified); one C_8H_{16} hydrocarbon (molecular weight=112) (specific isomer unidentified). Also indicated are carbonyl sulfide (COS) and carbon disulfide (CS_2). There are possibly heavier hydrocarbons present such as two $C_{20}H_{42}$ components and a $C_{23}H_{43}$ component.

This sample compares with FT-IR spectra in other samples that Budinger has examined, and there is no question of the composition. It is positively identified as containing secondary amide linkages similar to protein, and compares closely to silk. This would seem to add ammunition to the spider web theory, but the seemingly biological origin by no means proves this. Also, the addition of volatiles seems to contradict the spider theory, and may explain sublimation. Moreover, Budinger believes this is not web material.

SUBLIMATION OF ANGEL HAIR

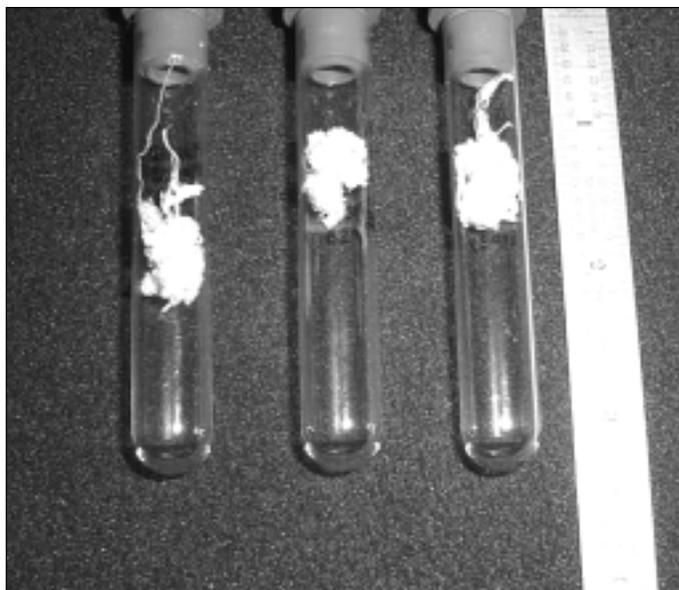
Angel hair sublimation is reported in 40% of the cases. To dismiss reports of angel hair sublimation would be analogous to dismissing reports of EM effects or trace cases associated with UFO reports. There are simply too many credible, competent witnesses who have observed these effects. One such case with an indisputably credible witness is worth recapping here.

In the summer of 1957, Craig Phillips, then a biologist with the U.S. Fish & Wildlife Service and curator of the Miami Seaquarium, was off the coast of Miami on the vessel *Sea Horse* collecting specimens when he observed “cobwebs” up to two feet in length drifting from the clear blue sky. Being interested in the biology of spiders and their webs, he retrieved some of this material.

From his report to NICAP:

With the intention of examining the strands under my laboratory microscope when we reached the Seaquarium, I carefully placed several of them inside a mason jar, allowing them to cling to the inside of the glass before I capped it. . . . however, when I uncapped the jar later in my office, no trace of the web material could be found. . . . From the foregoing, I would say that it is possible that the strands we saw were something other than spider web, and I have no explanation for the apparent disappearance of the collected material in the mason jar.¹⁷

The degree of reported sublimation is probably due to many variables. As stated before, angel hair is not one substance, but a complex polymer that may be composed of



a variety of substances, including volatiles. Most probably, the degree of sublimation is a function of the volatile content, atmospheric conditions, and the addition of heat. It is known that refrigerating or freezing angel hair slows or stops sublimation. This may be due to angel hair being formed in cooler air at altitude where it may be stable. Witnesses have reported angel hair actually sublimating as it falls before reaching the ground. Interestingly, there was no indication of a temperature inversion in the weather data.

The property of sublimation may be used to differentiate “true” angel hair from fall-outs of industrial residues or natural sources. Spider web is a common material, even if vast skyfalls are not. It would seem that witnesses would not report sublimation unless this material had vastly different

properties than web material. Witnesses separated by decades and continents have reported that angel hair has *sublimated in their presence in minutes*.

A comparison of weather data between cases with and without sublimation is shown in the table below. Unfortunately, the data are limited to only 54 cases, and relative humidity is only available for 15 of these. Out of these 15 cases, 8 samples sublimated and 7 did not, and the average relative humidity of the sublimation cases was 45% versus 35% of the nonsublimation cases. Both sets had at least one case as high as 71%. This seems to indicate that relative humidity is not necessarily correlated to sublimation, but *is* correlated to angel hair falls, as these are both low figures.

Sublimation and Weather

| | <i>Sublimation</i> | <i>No Sublimation</i> |
|---------------------|--------------------|-----------------------|
| Average Temp. | 58.16°F | 58.40°F |
| Max. Temp | 86°F | 73°F |
| Min. Temp | 19°F | 42°F |
| Total Precipitation | .04" | 1.43" |
| Relative Humidity | 45% | 35% |
| Average Cloud Cover | 2/10 | 2/10 |

Are UFOs linked to sublimation? To test for a statistical correlation between UFOs and sublimation, I created the table below. We can see that slightly over half of cases with no sublimation included the sighting of a UFO, but about two-thirds of the cases with sublimation had an associated UFO sighting. I used the chi square test to compare the values of the observed phenomena with those values we would expect if there were no relationship. If the test is significant, it implies that UFOs are, in this instance, more likely to be associated with cases where the angel hair sublimated.

| | <i>No Sublimation</i> | <i>Sublimation</i> | <i>Total</i> |
|--------------|-----------------------|--------------------|--------------|
| UFO Not Seen | 60 | 32 | 92 |
| UFO Seen | 70 | 53 | 123 |
| Total | 130 | 85 | 215 |

For the above table, chi square is 1.519. For significance at the .05 level, chi square should be 3.84 or greater, so the two characteristics are not associated. In other words, UFOs do not appear more often when there is sublimation.

I created a similar table to examine the relationship between UFO waves and sublimation. We see that almost exactly half of the cases with sublimation occurred during the October waves (1954 and 1973), and half in other non-wave periods. A slightly higher percentage of no sublimation cases occurred in non-wave periods.

| | <i>No Sublimation</i> | <i>Sublimation</i> | <i>Total</i> |
|------------------|-----------------------|--------------------|--------------|
| October Waves | 23 | 21 | 44 |
| Non-Wave Periods | 29 | 22 | 51 |
| Total | 52 | 43 | 95 |

For the above table, chi square is again nonsignificant, so cases with sublimation do not appear more, or less often, during UFO waves.

The fact that there are no significant associations in the above data is interesting. This does not mean that angel hair is spider web, or conversely that all angel hair is not. This is certainly not the case, and there are clearly properties not accounted for. Also, UFOs are probably under-reported in angel-hair cases, although UFOs observed in 57% of all angel-hair cases is certainly significant. This is because a UFO may pass by and drop angel hair, but only the angel hair be seen when it falls onto the ground or vegetation.

ANGEL-HAIR CASE PROPERTIES

The relative numbers of cases with sublimation, UFOs, UFOs and sublimation, and just angel hair are shown in Chart 1. The October peak is very apparent, with 45% of all cases. October and November account for fully 63% of all cases. Out of 123 total cases with a UFO report, October has an astounding 56, or 45%. November has 24, or 20%.

Case percentages by month—215 cases total

| | | | |
|----------|------|-----------|-------|
| January | 1.8% | July | 5.1% |
| February | 3.2% | August | 5.5% |
| March | 2.3% | September | 6.9% |
| April | 1.8% | October | 45.1% |
| May | 5.5% | November | 18.1% |
| June | 5.1% | December | 1.8% |

CORRELATION TO UFO WAVES

One of the mysterious features of the angel-hair enigma is that while it shows definite signs of connections to UFOs, it is not prominent in all UFO waves. Looking at the classic wave years of 1947, 1952, 1954, 1957, 1966–1967, and 1973, a very interesting correlation emerges.

In this macro view (Chart 2), angel hair seems to track the UFO data (from Larry Hatch's *U* Database, www.larryhatch.net) only somewhat, with an exception being the large spike of the 1954 wave, and a small spike during the 1973 wave. There is no correlation with the 1947, 1952, 1957, and the 1966–1967 waves. There is a very specific correlation to the 1954 and 1973 waves, which were both in October. The 1947 wave is totally devoid of angel hair, but there were very few trace cases of any kind associated with this wave. The 1952 and 1957 waves are also negatively correlated with angel hair. The lack of angel-hair cases during the 1966–1967 waves is a real mystery, given the unrivaled volume of UFO reports during these years. Ted Phillips's data indicate there was a plethora of trace cases during these years, and angel hair seems to track the EM and trace data.

A note should also be made concerning 1977–1978. There was a long-lasting worldwide wave that was most

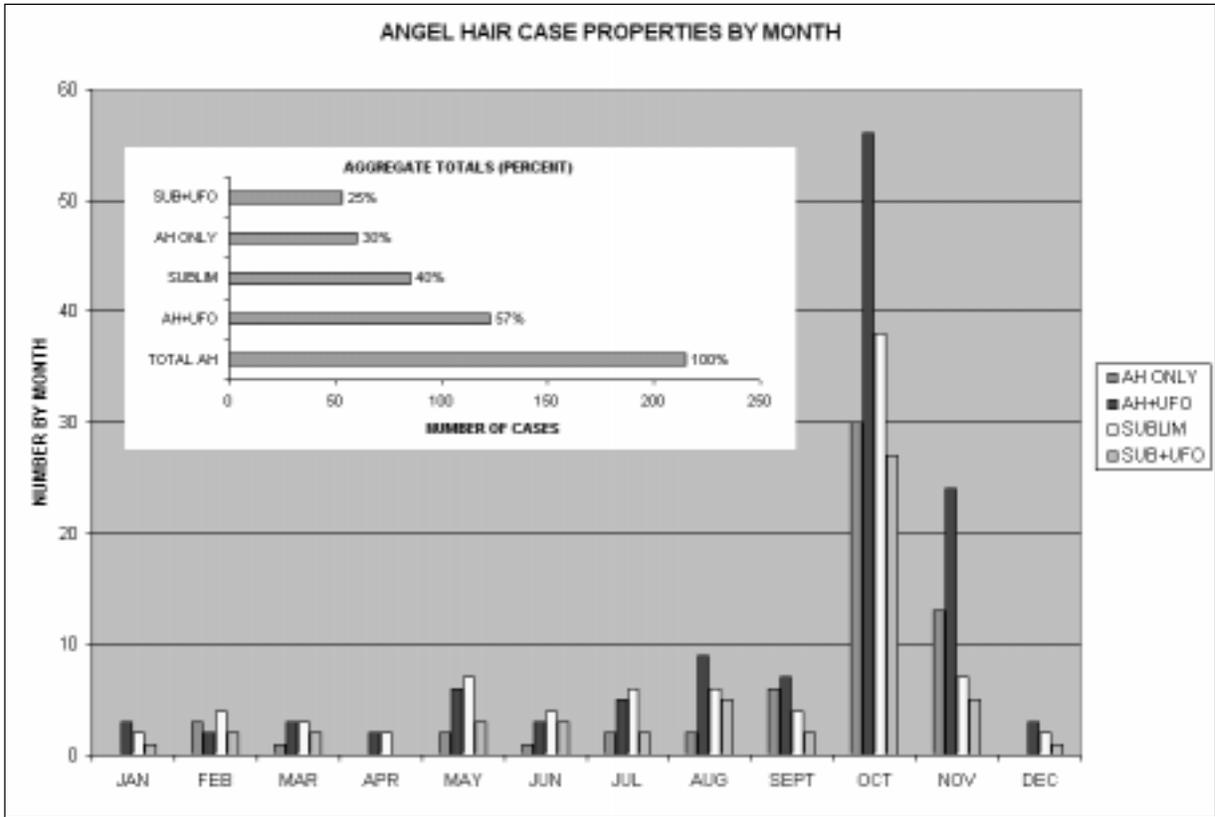


Chart 1.

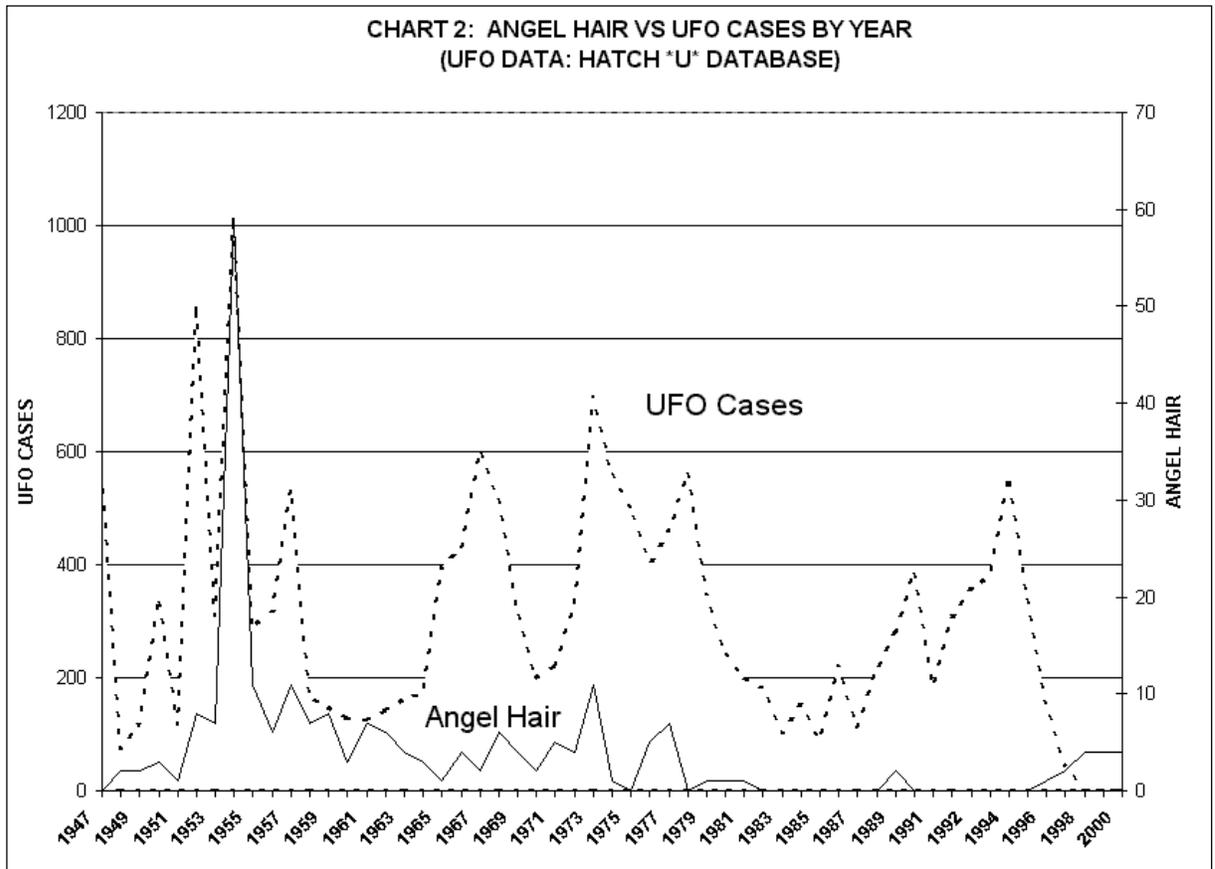


Chart 2.

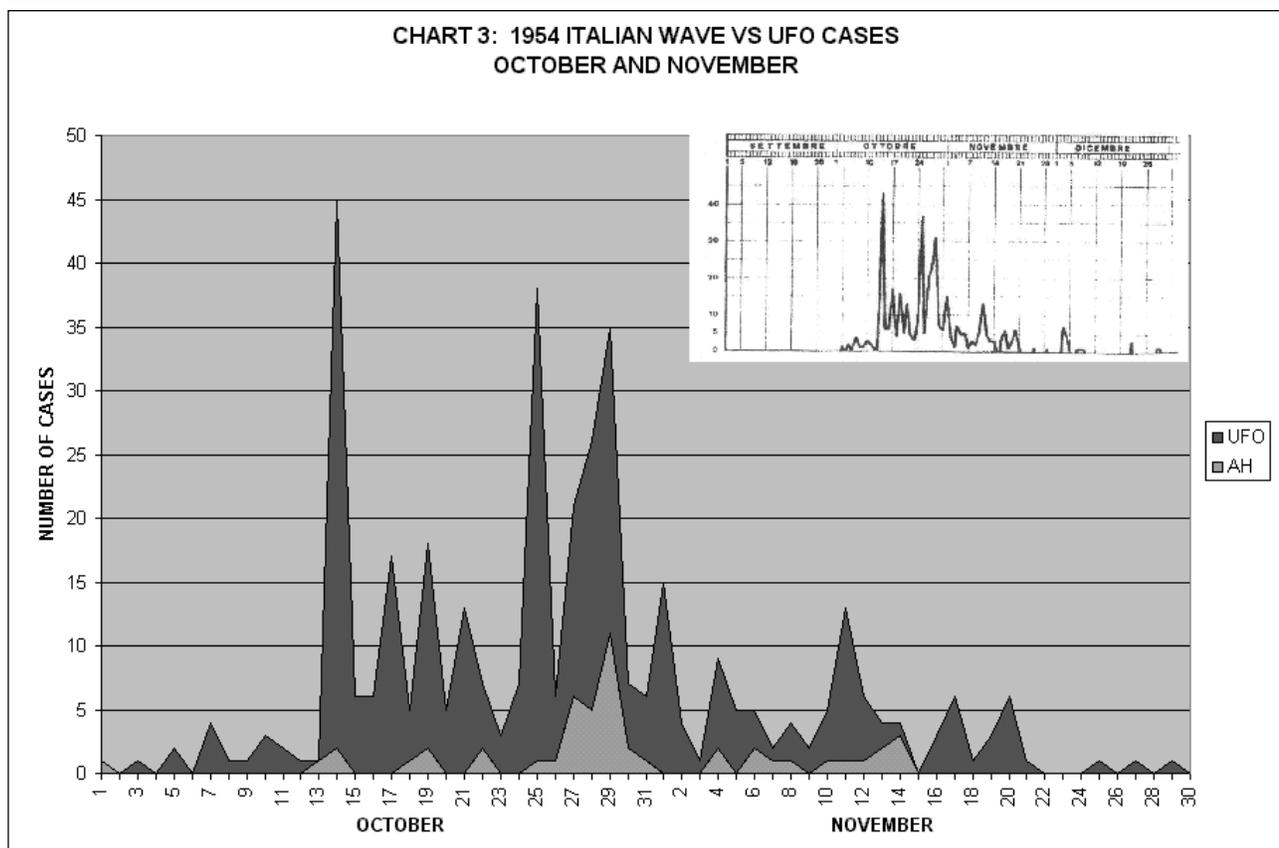


Chart 3.

prominent in the Southern hemisphere, although the United States was not devoid of high quality cases. There were seven angel-hair cases in 1977, but only one in 1978. Since the wave was primarily in 1978, these cases may or may not be wave related.

While not all waves involve angel hair, the 1954 and 1973 waves *are* correlated to angel-hair falls. This leads to the question: What do these waves have in common, and what differentiates them from the others? The answer is that these are both *classic explosive short-term October waves*. The characteristics of a classic short-term, broad distribution wave as defined by Eddie Bullard are:

For two weeks to perhaps three or four months, UFOs by the thousands appear in national and international skies, attract temporary media attention, then disappear once again. . . . An explosive wave begins with a spectacular, well-publicized triggering event, builds up in a few days and spreads quickly over a widening area, peaks, and then falls off rapidly, typically spanning about three weeks.¹⁸

The 1954 European (France and Italy) and the 1973 U.S. October waves were very similar in duration, but the 1954 wave had 4.5 times as many angel hair cases. Both of these waves were replete with a large quantity of high strangeness cases of high quality involving entity sightings, electromagnetic (EM) effects, and *angel hair peaks coincident with the wave peaks*.

The noncorrelated waves either had July peaks (1947, 1952) or were *pandemic* (1966–1967) or widespread, long-lasting, and global in nature. The 1957 wave occurred in November, and there is no correlation to this wave.

A cursory look at the table at the bottom of the page may only seem to reveal the widely known annual October peak (note how even in 1957 there were cases in October but none in November), but a closer examination of the case distribution during the actual waves themselves indicates a subtle, more precise correlation. Note that the case numbers during these years were essentially flat until the October peak. A closer examination of the case distribution during these waves shows several very interesting correlations.

The angel hair peak for this century is in October of

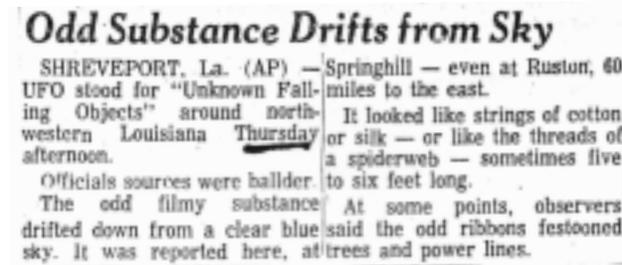
Fall wave years—Angel hair cases

| | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
|------|-----|-----|-----|-------|-----|------|------|-----|------|-----|-----|-----|
| 1954 | 0 | 2 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 36 | 16 | 2 |
| 1957 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 5 | 0 | 0 |
| 1973 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 8 | 1 | 0 |

1954, and is quite obvious in Chart 2. As mentioned above, angel hair cases also correlate with this wave. Chart 3 shows very graphically that the peak case dates coincide for UFO cases and angel hair cases in the Italian wave.

THE 1973 WAVE

Even before the peak of the wave, high-quality witnesses had reported UFOs. Of these, none other than Ohio Governor John Gilligan witnessed a UFO on October 15, and Walter Cronkite reported this on the CBS evening news. There were angel hair cases on the 17th, 18th, 22nd, and 23rd. The peak date of the wave was the 18th. There were five angel-hair cases on the 18th, from Illinois to Louisiana. The following news clipping from the *New Orleans Times-Picayune*, October 19, 1973, is representative of the October 18 angel-hair press coverage of the south central U.S.



Another angel-hair case on the 18th occurred in Hamilton, Illinois, at 3:30 p.m. The witnesses observed what was described as a huge oval or oblong UFO that was described as near gray in color. A second object was then seen that resembled the first object, but seemed to be covered with "cobwebs" on the upper surface. About 15 minutes later, "cotton-like" material was found that when handled "became a small ball which melted as it was touched." The next morning a sample that was retrieved had totally sublimated.¹⁹

CORRELATION TO ENTITY SIGHTINGS

Both the 1954 and 1973 waves included many entity reports. One of the most famous of these occurred on October 11, 1973, involving Charles Hickson and Calvin Parker. The details are widely known and available, so only a brief synopsis will be given.

Around 5 p.m., Hickson and Parker were fishing on the Pascagoula River in Mississippi. They observed a football- or cigar-shaped UFO, and then were taken into the object where they were examined by very strange creatures with gray skin and claws for hands. What impressed the investigators of this case (including Hynek) was the veracity of the witnesses, including secret recordings where they discussed the experience, and later polygraph tests that they both passed.

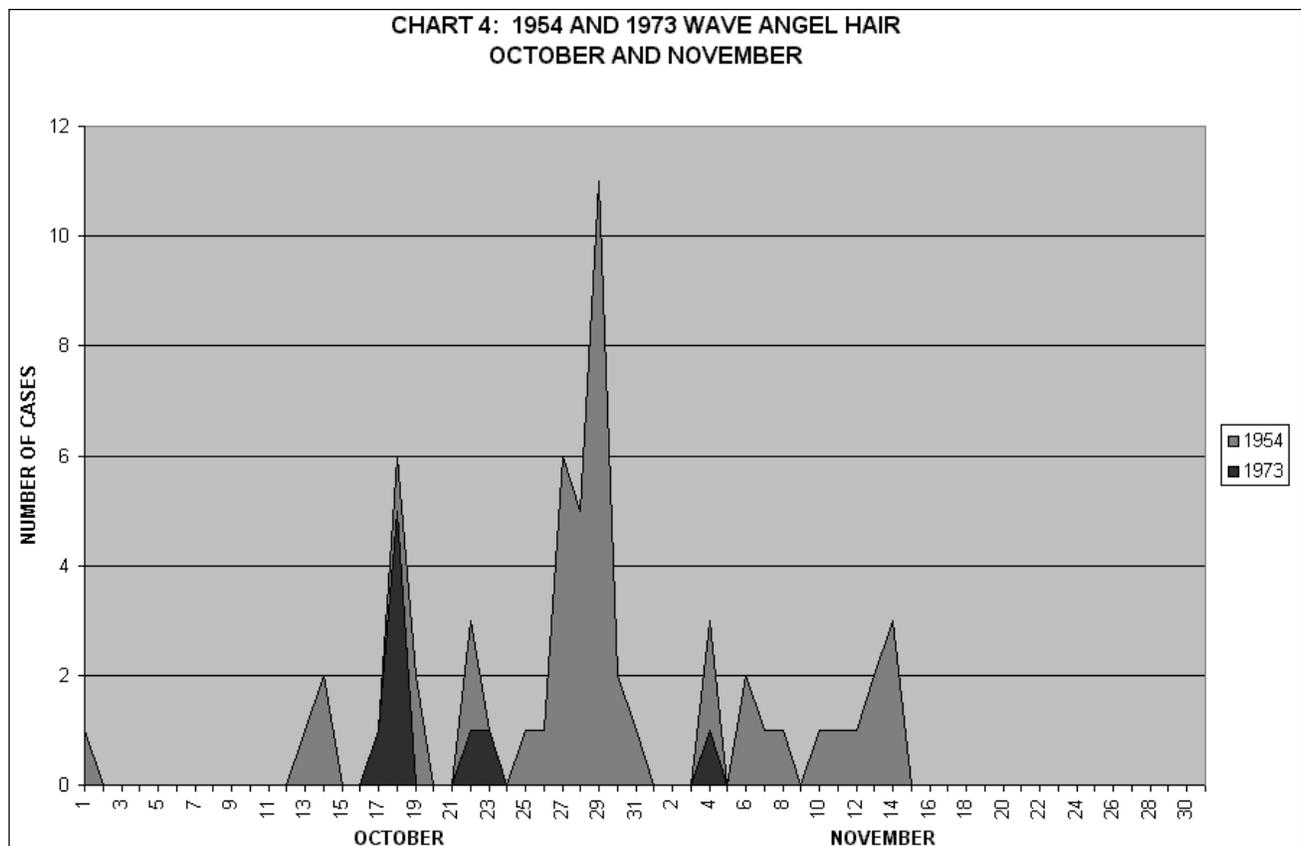


Chart 4.

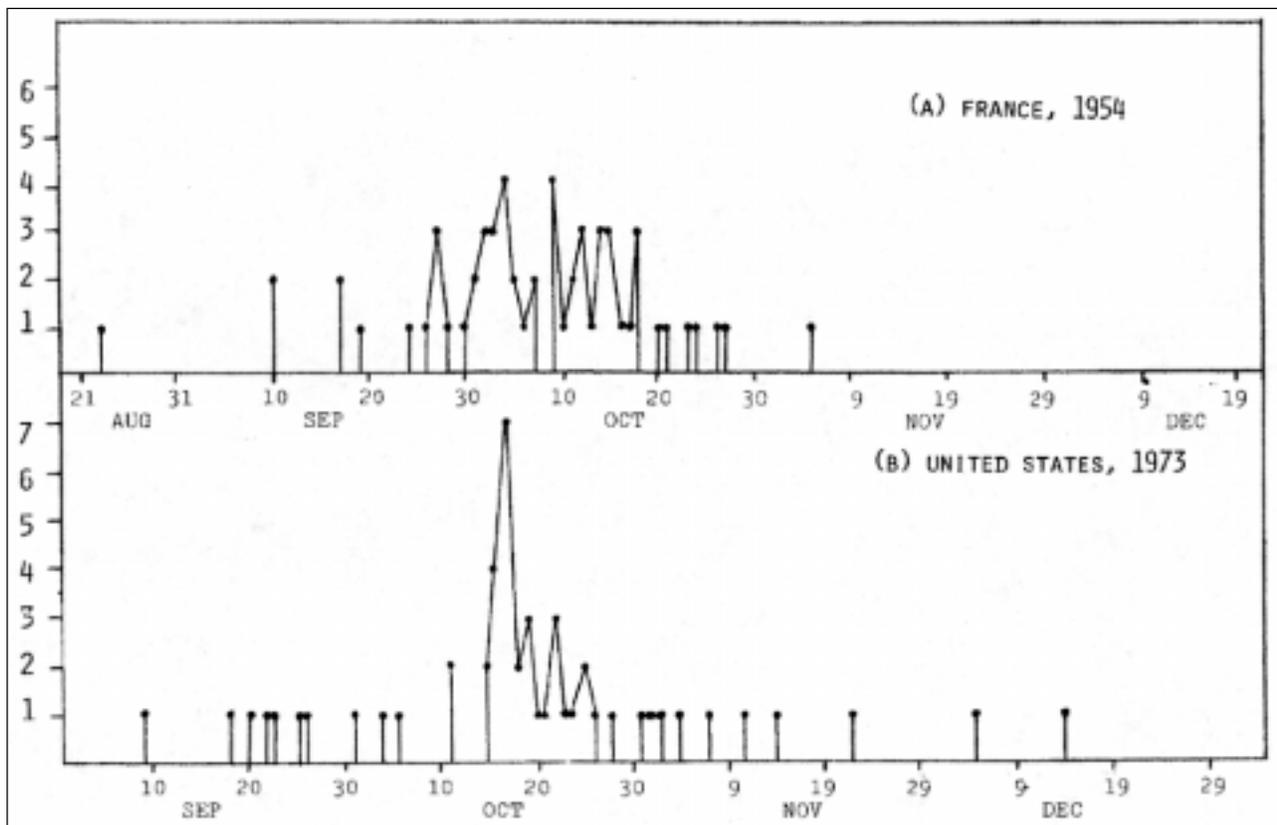


Chart 5. Humanoid distribution, 1954 and 1973 waves.

What is really interesting about the entity reports is that they correlate with the peaks of both waves. Compare Chart 4 with Chart 5.

CONCLUSION

The correlations with the 1954 and 1973 waves seem to be very strong evidence that angel hair is a constituent of the UFO phenomenon. Further evidence of this is the high percentage of UFOs concurrent with angel-hair falls, and the number of reports of sublimation. The entity reports provide a three-way correlation.

If the spider-web theory were correct, then we would have to conclude that many UFO reports, and even UFO waves, are stimulated by web material in the sky. But if angel hair is primarily spider web, and spider ballooning is a well-known natural phenomenon, why were there so few reported cases during the 80s and 90s? We would expect a naturally occurring phenomenon to lead to relatively constant numbers over time, without such wide variation.

If spider webs are angel hair, then we have been the victims of a cruel joke of nature, the similarity of two separate phenomena, both in appearance and pattern. But I consider spider web to be a red herring. Charles Fort put it like this:

It's difficult to express that silky substances that have fallen to this earth were not spider webs. My own acceptance is that spider webs are the merger; that there have been falls of an externally derived silky substance,

and also of the webs, or strands, rather, of aeronautic spiders indigenous to this earth; that in some instances it is impossible to distinguish one from the other.

While it is true that correlation does not prove causation, the evidence seems overwhelming that angel-hair cases are indeed related to genuine UFOs, and provides more evidence of their reality. Both UFOs and angel hair deserve the serious attention of the scientific community.

ACKNOWLEDGMENTS

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