

RESEARCH ARTICLE

Strange Handprints in Strange Places

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Abstract—Increasingly, items have appeared on the Internet reporting the appearance of handprints on home mirrors and windows, inside and outside. The odd shapes and sizes observed have led reporters to suggest that they have spirit or alien sources. Often they are photodocumented. We became interested in the topic when we were asked to evaluate a double-pane thermal window on which handprints had recently appeared. The window had been in place for more than 20 years. The prints all appeared on the same inside surface (same pane). The two panes were, surprisingly, separated by 0.25 inch.

Keywords: handprints—flash photography—aliens—spirits—glass—mirrors

Introduction

Recently, the number of reports, often on the Internet, that discuss the appearance of mysterious handprints has dramatically increased (see, for example, Intenzo 2014, Asarella 2013). These include handprints on a mirror or window that had not been there moments earlier, or handprints on a window on an upper floor of a building. Such handprints are often of unusual shapes and sizes, found in unusual locations, and may appear/disappear. From a forensic/law enforcement standpoint, obvious questions may arise. For a handprint on a window, was there an attempted break-in? From a handprint appearing on a mirror, was there already an actual break-in? Interpretations involving paranormal activity frequently follow. A handprint appearing on a bathroom mirror could be a message from a spirit. A newly appearing handprint on the outside of an apartment window above ground level would have to be that of an alien, because of both the location and the inexplicable shapes and sizes of the handprints. Our interest in this area began when we were asked to examine/investigate a thermal home window (double-paned) in which fingerprints had appeared on the *inside* surface of one pane.

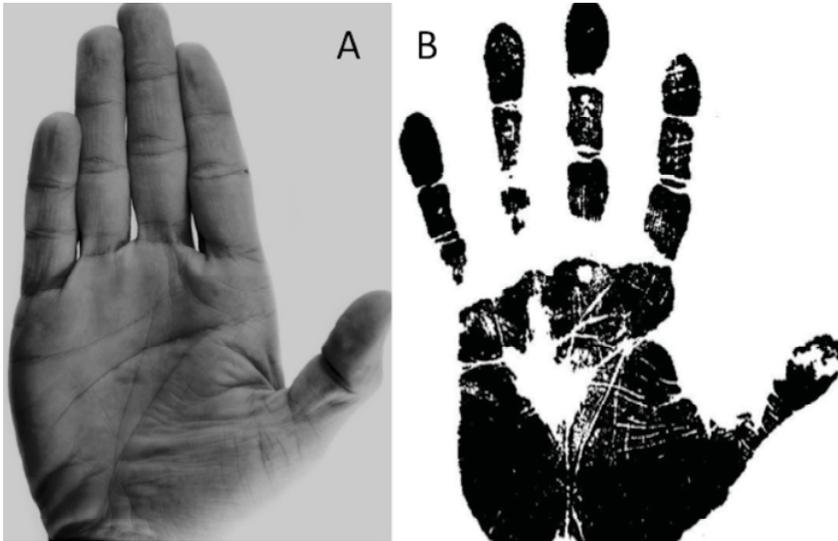


Figure 1. Hand and Palm Details. (A) Photograph of a hand (based on a public domain picture, hand on white free stock photo from PublicDomainPictures.net). (B) Typical hand/palm print such as might be left at a crime scene (shown in black to allow details to be seen).

We are not aware of any formal discussion of these appearing handprints, and would like to put the observations and unique characteristics into an appropriate perspective, so that anyone could reach a plausible initial conclusion.

Appearance and Composition of a True Human Handprint

If one places a hand on glass, and photographs it or scans it, Figure 1A results. This is a photo of a hand, not a handprint. Many unique characteristics from fingerprint minutiae to ridges on the palm can be seen. In contrast, if someone touches a surface and leaves behind an actual oily handprint, it will resemble not Figure 1A, but Figure 1B. Because of the muscles and the arched, three-dimensional structure of the hand, contact is often not made between the fingers and the palm, and the arched palm often leaves a mid-palm area where no physical contact occurs, leaving blank areas in the real handprint.

In terms of chemical composition, fingerprints and handprints are often thought of as being oily, or similar to an oil and water mix. It has been suggested that a hand/finger print itself closely resembles chicken broth, since it is made by boiling chicken skin. Human skin has three different

kinds of glands that secrete materials through pores on the skin. Surprisingly, the glands that generate oily materials are not present on the palmar and plantar surfaces (hands and feet). Eccrine glands generate aqueous solutions (“sweat”). This is one way that your body disposes of materials it does not need, which is why sweat in some ways has a similar composition to urine. Pores on the ridges of hands and feet, for example, are connected to eccrine glands, which generate aqueous solutions containing small organic and inorganic compounds. Ridgelines improve friction on, e.g., the fingers, and the sweat generated on fingers further enhances friction. There are glands that generate an oily material (containing fatty acids and hydrocarbons), the sebaceous glands, usually associated with hair follicles, over much of the rest of the body. These oily materials get onto our palms/fingers when we touch our face and hair, which most people frequently do. Also the oils formed on the back of the hands and fingers can flow/migrate to the ridge regions (Kent 2000).

While water is the most volatile component of a fingerprint or handprint, and will evaporate relatively quickly, other materials can remain where they are initially deposited for many years. Glass is an ideal surface for depositing finger or palm prints, because the components cannot be absorbed into the substrate, in contrast to, for example, a handprint deposited onto paper.

Mysterious Handprints—Characteristics and Observations

The ParaResearchers of Ontario would classify the handprints that will be discussed as **Level 2** environmental physical phenomena, a designation used where “human marks such as handprints with no apparent human agent” are found (ParaResearchers 1999). We will use this classification code, and expand on it.

Level 2(i) Handprint. These are often found on glass or mirrored surfaces. The (i) designation will refer here to an interior print, one found inside a structure. They have several things in common. First, the observers often report that there was nothing present on the glass surface, and a few minutes later a handprint appears. (Perhaps an alternative statement is that the handprint was not readily visible, but could be seen a few moments later.) It is rare that the observer actually sees the image as it is forming. The second characteristic is that they often look larger than normal handprints, and have unusual shapes. Third, reports are often accompanied by photographs, documenting what was seen. As is the case with “orbs,” photographs are usually taken with digital cameras that have a flash. An example of a Level 2(i) handprint is shown in Figure 2. Reportedly, there was nothing on the mirror, but suddenly a handprint appeared, which was



Figure 2. A Level 2(i) handprint on a bathroom mirror. After it appeared, the observer captured the image with a digital flash camera. The image appeared to be composed of a white powdery substance.

photodocumented using a digital camera with the flash on.

Level 2(e) Handprint. The (e) indicates that it was external to a building, most often on the outside of a window. Figure 3 shows a good example of a Level 2(e) handprint (Prosser 2010). On an upper floor of an apartment building in Australia, the handprint shown was found one night on the outside of the windowpane. It was photographed. The photographer came back the next day and it was gone, or as the observers concluded, it “had been removed.” There are many other examples on the Internet, where the shapes are often similar. Aspects that need to be understood include:

- The shape and size of the handprint. They often don’t look like a human hand at all. The fingers are straight, long, and parallel but separated, while human fingers often naturally “fan out.”
- The location. This one in Figure 3 was found in a place that is hard to access. The observers often reason that, obviously, such Level 2(e) handprints do not resemble the Figure 1 images, so that one must conclude that they are “likely from an intergalactic visitor.” (Perhaps they can move more easily about, vertically.)
- There often seems to be some “It was there, then it was gone” (or the opposite) aspect to the accompanying story.



Figure 3. An example of a Level 2(e) handprint. The image (left) appears outside, on a windowpane. In this case, it was on an upper floor of an apartment building. The photographer returned the next day to take more photos of it, but it was gone (right). Based on this, the observers concluded that it was not from a human source.

Relevant Commonly Known Facts

Braude (2012) recently wrote, “all sides of the psi debate (believers, doubters, and deniers) are guided by some combination of intuition (or “passion”) and reason.” One would hope that reason would always prevail. Usually we learn new things by building on what we already know. However, that does not always seem to apply when spirits or aliens are being considered.

Consider again in Figure 3, the photo of the alien Level 2(e) type handprint on the outside of the window, taken in the evening. One can clearly see there is rain or perhaps a foggy condensation on the window, which is not mentioned in the report. The photo of the window the next day shows that the weather had cleared and the handprint could no longer be seen. Most people have certain life experiences that could help put mysteries such as this one into some context. Perhaps they are aware of the analysis of fingerprints in forensic science, in which oily deposits have already been made on a surface . . . deposits that essentially can’t be seen (latent fingerprints), where they use dusting powders that will stick to the oily print, allowing it to be seen (visualized). At least some people should have had childhood experiences involving writing on glass surfaces, related to the oils on the surface of your fingers/hands, which do not mix well with

water. Children often write on the inside of a fogged-up car window on a cold day, and the next time the window fogs up, the writing “reappears.” We know that the writing (oily finger on the glass) did not mysteriously disappear. It never left. One can equally well write on the outside of a car on a foggy night and have it reappear when conditions are similar.

Analogous observations could be found in the bathroom—such as writing on a mirror or shower door with soap or your finger that becomes visible when humidity in the room rises. Again, the oily print is not absorbed into the glass, and so remains on the surface. Knowing that oil and water do not mix is a simple enough concept to explain why water (a polar material) does not condense on those parts of a glass surface that contains an oily film (a nonpolar material), but does condense on the glass (a polar surface). Many people should have experiences with images appearing/disappearing on glass surfaces as humidity changes. Figure 3 should at least in some ways be explicable.

While such observations are interesting in the context of the mystery, they *do not*, in fact, explain Level 2(e) reports because those handprints appear “white,” not clear on a “white” background. One often does not know, for an exterior handprint, enough about the history of the building or the window to know when windows were last touched, to consider the likelihood of a person, possibly on a ladder, using their hands to perhaps push the window closed, wash the window, or push a new window into place, which could leave handprint oils behind.

We performed several experiments to explore possibilities that seemed likely from the observations that usually accompany mysterious handprint reports.

Possible Chemical Aspects/Gloves as Part of the Model

We considered Level 2(i) cases, since we usually know more of the possibilities concerning the history of access to the surfaces on which the handprints appear. We first chose to investigate possible *chemistry* that could explain the handprints and their behavior. A handprint appears in a bathroom. Presumably the space is periodically cleaned by the owners, or by a housekeeper who visits periodically. It would not be unreasonable for someone to have cleaning solutions on their hands and to accidentally lean on the window or glass surface, leaving behind a latent chemical film. Perhaps even a small increase in relative humidity would be enough to interact with the film and form a white powdery product. We investigated this first.

If a thin film of some cleaning material is deposited from a hand/glove to the mirror, then perhaps some hot water running briefly in the sink below the mirror could be sufficient to create steam to react with the thin film and form a white solid product. A selection of personal products, cleaning materials, and other products that may be found in a bathroom were collected. We simultaneously considered the possibility that the unusual handprint shapes could arise from gloves worn while cleaning, so we investigated a number of ways to make handprints on glass using gloves.

The chemical products investigated included: hand lotions, Neutrogena Clear Pore Astringent, Green Works Dishwashing Liquid, 409 All Purpose Cleaner, a variety of toilet bowl cleaners including Clorox Toilet Bowl Cleaner (with bleach), ammonia-containing cleaning solutions, a lens cleaning solution (for eyeglasses), hydrogen peroxide, Niagara Spray Starch, Lysol Power Foam, and Pine Sol. For each, a thin film was deposited on a clean piece of glass by lightly wiping a small amount across the glass with a small sponge that had been dipped into the various solutions. Liquids were either used straight from the container, or at a diluted level as suggested for cleaning by the manufacturer. Then each solution was diluted 10:1 with water and again wiped across a glass surface. The films were allowed to dry. The diluted solutions resulted in much thinner films. Each sample was placed in a holder over a laboratory sink in which hot water was running, exposing the films to the rising steam. Our goal was to find a film that could not be seen but, when exposed to steam, turned into a white surface with a chalky appearance. None of the samples behaved as anticipated; the closest was Clorox Toilet Bowl Cleaner with Bleach—it did appear to interact with steam and become easier to see, although even a thin film can be seen easily *before* exposure to increased water vapor.

To investigate the question of whether unusual handprints could be made if gloves were used, we collected a variety of gloves—nitrile, latex, and latex-free. We found very thin gloves, thick-textured gloves, and included gloves in a variety of sizes. We collected glove prints by wearing them, packing them with paper, and even inflating them. We sprayed each glove with white spray paint and made a print on a glass surface to record the shape. The shapes were somewhat unusual, but not similar to any of the handprints we've seen reported. We did learn that, when selecting gloves of different sizes, selecting a "large" size does not necessarily mean the fingers are longer, but they are wider. Again, while it is quite possible that someone cleaning a bathroom would use gloves, they did not appear to be relevant to the reported handprint shapes.

Photodocumentation

Most of the reports, especially of Level 2(i) handprints, were photodocumented, usually by using a digital camera with a flash. In the Forensic Community, where low-magnification microscopy is a useful tool, it is common to vary illumination angle. In some cases, surface features show up if the light shines on the object at a particular angle. Also of note, a team member of the *GhostStudy.com* website wrote a short observation of a persistent handprint on her aunt's wall, stating that "when the light caught it just right you could see it perfectly" (Starleen 2003).

Such considerations led to the following experiment; we rubbed a hand on our head and face and used it to create an oily handprint deposit on a mirror. Once handprints were made on glass and mirrored surfaces, we realized that they could usually be seen, especially if a light source was nearby, or if one knew where to look. The lights were then turned out. In darkness, a flashlight was used to find the handprint, and to illuminate it from different angles. At some angles, the simple handprint could be easily seen. At those same angles, a photograph was then taken using a camera with a flash, and the handprint could be clearly seen. The thin film efficiently reflects light back to the viewer. The details of the handprint appear white, although they are not actually white; it is just the white light from the flash being reflected. Flash cameras also make it easier to visualize a Level 2(e) print. In one of the many blogs on mysterious handprints, Tina F. (2012) posted a discussion and photo of handprints appearing in her grandmother's house on a mirror. "When they form, they have a gooey substance on them. . . . In these photos, I put blush [on them] so they show up better." This is a useful report. The oil and water human finger/handprints can easily be smeared—which could seem to an observer as "gooey." Also, makeup such as blush is very similar to forensic dusting powders. They are both fine powders that contain color and have an affinity for an oily material on the surface (of a mirror or your skin).

Mysterious Handprint Shapes

At this point, we are at an ultimate model in simplicity—the handprints could be just simple human handprint deposits, although the shapes can be very unusual. How can one make a large "alien" handprint, with long, parallel, separated fingers, very different from human prints? Also, why do they rarely show fingerprints and other details? If one looks for the kind of details seen in Figure 1, many are not present in the reported prints.

We discovered a simple approach to making handprints such as that

seen in Figure 3. Again, begin by getting natural oils on your entire hand by rubbing your face and hair. Then put four fingertips on the surface, and pull them straight down. When these parallel “fingers” that you draw are sufficiently long, press the rest of your hand onto the surface to make the palm and thumb sections. With a digital camera using the flash, one can now create, illuminate, and capture the mysterious handprints that are reported on the Internet. Again, the quality of the photo depends in part on the illumination angle, with light impinging on the image nearly perpendicular to the surface being ideal. At larger angles from the normal, one may not see the handprint at all, or only a part of it may “light up.” But with a little practice the unusual handprints so common to this field can be photographed. Again, while the handprint almost appears as a white powder, it is just an illusion due to the flash’s light bouncing off the oily surface.

We have an organic teaching lab in the Chemistry Building of The College of New Jersey, and many of the (mostly glass) fume hoods are connected to each other, providing a substantial glass surface to experiment with. Tests were done right after spring semester was over and the rooms had been cleaned. Each hood sash is five feet wide, all glass, and a good place to experiment. Three different handprints were made, spaced across the five-foot span of one hood. When the lights were on, they could not be seen. If one stands off to the side and photographs them in the dark, they cannot be seen. In the dark, standing in front of the first handprint, the photo in Figure 4A was captured. This is a typical handprint. Figure 4B shows an expanded view of the fingerprints of that handprint—the minutiae and details can be easily seen in the photo. The center of the camera flash appears close to the upper palm. If the camera is moved off to one side (or up or down), the handprint cannot be photographed. It is also interesting to note in Figure 4 that there are marks that were on the sash that appear to be cleaning material deposits such as soap residue. The stroke of a sponge or cloth can be clearly seen. Figure 5 shows the third handprint that was made on the fume hood sash. It is of the “alien type” handprint, made with very long fingers as described earlier. The hand is so long that there is almost no ideal place to put the camera to ensure that the entire print is captured. Again, these are made with only a typical oily human hand. The thin film reflects the light from the flash efficiently. One can see that it might appear to be a white powder to some. It is also noteworthy that, when a single fingerprint is deposited on a surface, the amount of material is only about 50 micrograms (0.000050 grams), so there is very little material (perhaps 2.5 milligrams) present in each handprint.



Figure 4. Photo (top) of a Level 2(i) handprint (top) made on a glass surface, and photographed in the dark with a flash. The image on the bottom shows the detail retained in some of the fingerprints, because they are from a human source.



Figure 5. Photo of an “alien handprint” made on a glass surface and photographed in the dark with a flash camera.



Figure 6. A portion of a thermal/double-pane window after a hole had been made in it. Images occurred because during the assembly of the mirror by a worker with no gloves left handprint and fingerprint deposits that interacted with a silver monolayer surface, making the handprints from the window assembly visible.

Level 2(d) Handprints

The observations and experiments reported above did not in any way prepare us for an opportunity to inspect a window from a house where, after more than 20 years of use, a double pane-insulating window served its purpose, and handprints appeared on it (see Figure 6). A closer inspection revealed that the handprints were on only one inside surface, between the panes, which were separated by 0.25 inches. Further, the handprints remained clearly visible, and were easy to see. All of the handprints were restricted to the inner surface of the outer pane (thus, we use the (d) label for double-pane window). Figure 6 shows the bottom portion of a window that had been compromised, and handprints appeared within.

These seemingly impossible handprints are easily understood after only a few minutes on the Internet. The observations are not unexpected for those who have worked for window companies, and have built windows before. On a web forum, there was a thread called “Strange Handprints on Windows,” and several people discussed the appearance of handprints on exterior windows.

Condorcet (2004) posted the following, in response to a report:

Your house has double-paned windows which were probably all assembled in a single day by a team of two people to fill an order for a homebuilder. On the day they were assembled one of the workers was a new employee who didn't understand the importance of wearing cotton gloves to prevent his skin oil from contaminating the glass. . . . if his hand print is between the glass panes, then it is possible that the seal on the panes has recently failed, allowing moisture to penetrate the space between. This happened to me re-

cently. No weird prints, though, just windows that looked permanently dirty.

Following this posting, there was another from Skullsplitter (2004):

Is that a double pane window? I am asking because during production, if the window is double paned, there is a type of glass that comes surfaced with this coating that is made to deflect the rays of the sun when it is at certain points in the sky. Often when the glass is sanded (the sharp edges are sanded down in a dual belt sander after it comes from the glazers), if someone touches this special coating without the proper gloves, it will leave a handprint. The print may look long, perhaps less like a hand, but it looks exactly like what would happen if someone had pushed the glass from the sanding table into the wash, accidentally placing the palm and fingers at two different points separately. When this glass is washed, it goes to the oven to be tempered and the handprint will be permanently burned into the surface of the glass. . . . I used to work at Summit Glass and Windows.

We received a window from a person on which permanent handprints appeared on an old thermal window. It was in fact a double-pane window, and the handprints were on an interior glass surface, and all of the prints were on the same interior surface, the interior of the outer pane, which is where the coatings are applied. At the time, a common material used was a monolayer of silver atoms. It was applied only to one surface, which would become the inner surface of the outer pane. A human handprint on the silver surface is somewhat unstable, but the panes are sealed into the frame, commonly using silicone, and the space between them filled with an inert gas such as argon. There may also be some kind of dessicant, which absorbs any water vapor that may find its way in (Milgard no date). These kinds of windows can be compromised over time, if part of the sealant becomes hard and brittle, from intense sunlight, or if a hole is somehow formed, which can let water vapor into the region between the panes. In this case, the gardener had accidentally launched a small stone projectile (using a weed whacker) at the window and a small hole resulted. Argon leaked out, humid air entered, and all fingerprints hidden in the coated surface appeared. (The surface is considered to be environmentally unstable.)

Without going into extensive detail, we have an instrument in The College of New Jersey Chemistry Department called a mass spectrometer, which analyzes positively or negatively charged gas phase ions that are derived from some analyte molecules. A nitrogen laser vaporizes a small amount of material from a surface. Some of the atoms and molecules that desorb off of the surface lose or gain an electron, and form ions with either a positive or negative charge on them. The ions are accelerated in an electric field, and travel a distance of approximately 1 meter. The time-

of-flight of each is measured, and related back to their masses, which can be related back to their identity. The experiment is called laser desorption mass spectrometry (Gross 2004). We focused on the positive ions that came off interior glass surfaces when irradiated with the pulsed laser. One glass pane had all of the handprints on it, so various points on the pane were analyzed. If the laser was focused on a non-interesting part of the glass surface, the mass spectrum obtained had a mass spectral peak at a mass-to-charge ratio (m/z) of 23 Daltons, which represents Na^+ ions, and peaks at m/z 39 and 41, representing the two major forms (isotopes) of potassium ions, K^+ , and there were two peaks at m/z 107 and 109 of nearly equal relative intensity which represent the two naturally occurring isotopes of silver ions (Ag^+). Interestingly, if the laser is focused on a portion of that surface where a smudge/partial handprint can be seen (Figure 6), it appears that the handprint's oily deposit assists in helping the silver atoms migrate on the surface and form small clusters, resulting in peaks in the mass spectrum representing Ag^+ , and Ag_2^+ (with mass-to-charge ratios of 214, 216 and 218). Ions representing Ag_3^+ and Ag_4^+ were observed as well. Atoms that were originally separated have now clustered together to make permanently visible handprint smudges. We note that, in black and white photography, it is atomic silver atom clusters that are responsible for the black portion of the image on the film and photographs. Apparently, as silver atoms cluster together, they become more visible, which is what happens on the surface of the inner piece of glass here. It is a common, and well-understood occurrence, catalyzed by water vapor in the air that moves into the inter-pane region once the seal is compromised. One can easily appreciate that what is seen in Figure 6 (a portion of the window) shows hands slipping on the glass as they push the pane.

Conclusions

There is a report from a woman who bought a house, and the first time she lay down in her bedroom and looked up at the high ceiling, she was dismayed that it was covered with handprints (the long-finger variety). The ceiling was washed, although the handprints returned quickly/new ones appeared (Missy 2006). It is not hard to imagine people trying to wash a high ceiling on ladders, touching the surface with their hands to stabilize themselves, their hand often slipping on the wet surface. It is consistent with what we report here.

There was a case where a 19-year-old student had disappeared, on the evening of February 12, 2007, from Edinboro University of Pennsylvania. A large handprint appeared on her dorm room window. Her dorm room door and windows were locked from the inside. Fortunately, NOAA has weather

information available for nearby Erie, Pennsylvania, and the temperature went down to 19° F that winter day, so the evening was foggy and cool, making condensation on the window surface more easily explained without having to invoke a psychic or alien source.

In terms of handprints on mirrors, certainly, someone could have been, for example, looking into the mirror above the bathroom sink because something was in their eye, or there was something they wanted to see on their face, and they left behind a handprint. While leaning, their hand could have slipped, forming an elongated shape. Someone such as a younger brother could have left a handprint or message written with their finger to scare a sister. There could be no intent or malicious intent, but if a thin film deposit exists, and initial illumination (such as sunlight coming through a window) is sufficient, its presence *may* be detected, and with a little experimenting, a very good image can be captured digitally. This does not negate the possibility of handprints from other sources. We only point out here that the mysterious handprints can easily be made, with characteristics that match those reported.

So, while the number of mysterious handprints that are being reported is increasing, we find that they *can* all be explained simply. The examples reported are most likely due to human beings.

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