

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

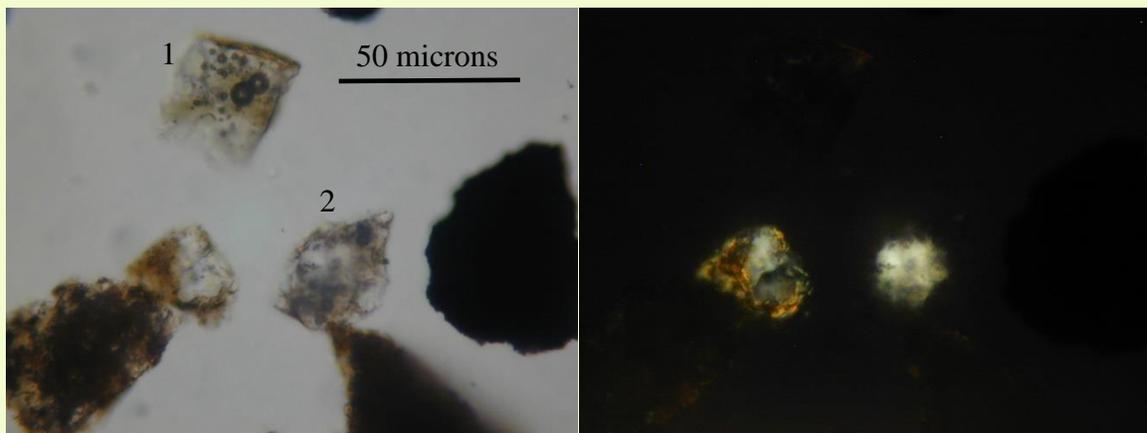
LAMONT-DOHERTY EARTH OBSERVATORY
P.O. Box 1000 61 Route 9W Palisades, NY 10964-8000 USA

27 January 2021

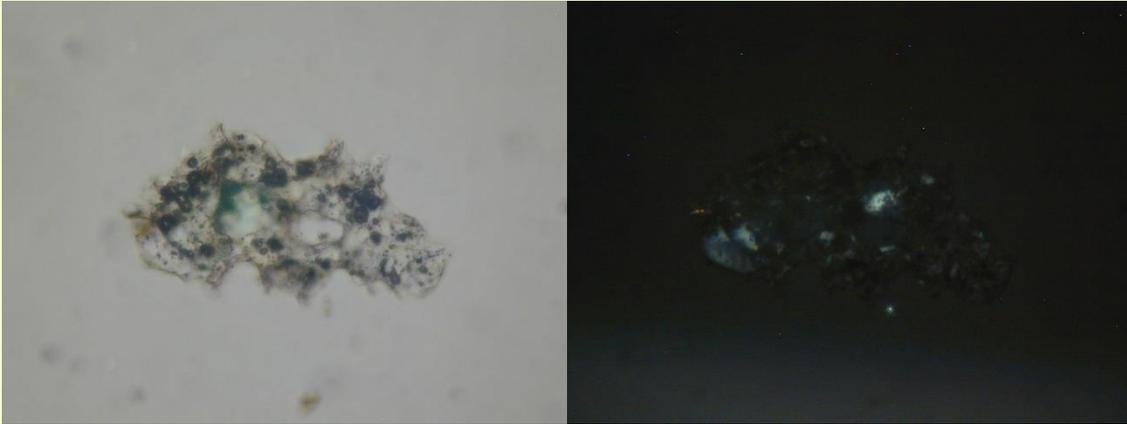
Mr. Joe Ritchie
12 Saratoga Sites
Cohoes NY 12047
Dear Joe,

I received your windshield dust sample post marked 21 January 2021 taken from your car at Saratoga Sites. It strongly resembles the dust sample of yours that I examined from your letter postmarked 5 December 2020, and Dave Publow's sample from Ed Sokol's attic across the street from Saratoga Sites on 7 January 2021. They are all rich in glassy-matrix, vesicular (bubbly) particles that strongly resemble heat-treated Norlite aggregate which I have also examined for comparison. These particles are not un-heat-treated shale, road dust, or other natural rock fragments. I confirm the determination given on the DEC website. The dust at Saratoga Sites is derived from Norlite aggregate. [AIR section of https://www.dec.ny.gov/docs/regions_pdf/r4norlitefaq.pdf] Your current sample differs from your 5 December 2020 sample in having a slightly higher content of quartz mineral shards. Both your samples differ from those of Ed's attic by being depleted in a fine fraction. Evidently the fine dust, which does not settle on your windshield, gets swept by wind currents as far as Ed's house at a minimum. No doubt it travels a good deal farther than that! The folks over in Troy, Green Island and Watervliet might be interested to see whether their air fallout has so rich a fraction of Norlite aggregate as you have in Cohoes. It is almost your whole budget, whereas theirs may be partially diluted by other dust sources. It would be interesting at some point to study the local extent, particle size, and spatial distribution of this dust.

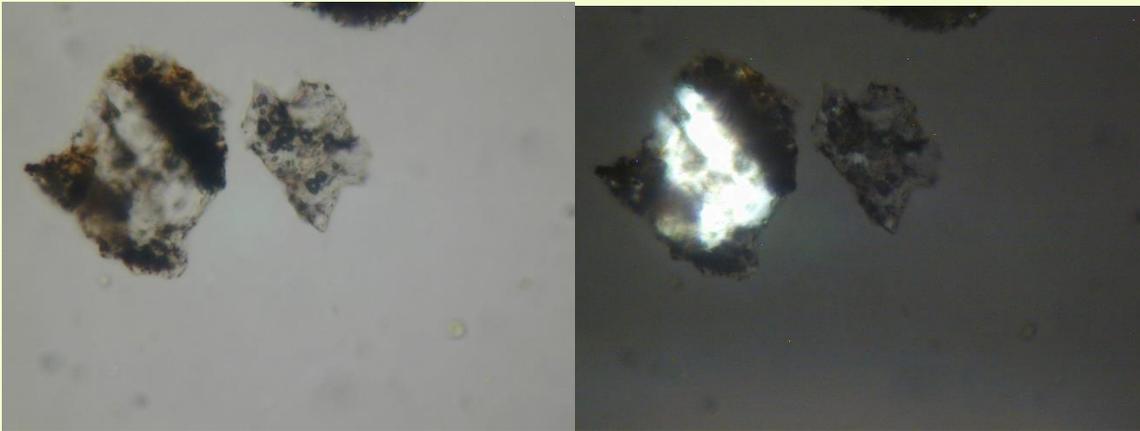
I record here optical photomicrographs of particles in your dust sample taken in $n=1.568$ immersion oil with all images shown at the same scale.



The first pair of images are the same field of view except the darker one on the right is X-polars to check for optical activity, which the unstrained glass, bubbles, and immersion index oil do not have. [This left-right pairing applies to all the images here.] The bright areas do have optical activity and indicate the presence of a low symmetry crystalline mineral. Particle 1 completely disappears on the right image indicating it is all glass and bubbles, whereas particle 2 has much glass but a chunk of optically active (lighted) quartz embedded within the glass. Note the pointy sharp edges on these glassy particles. For pointy, sharp edges on steroids, look at this next pair of images.



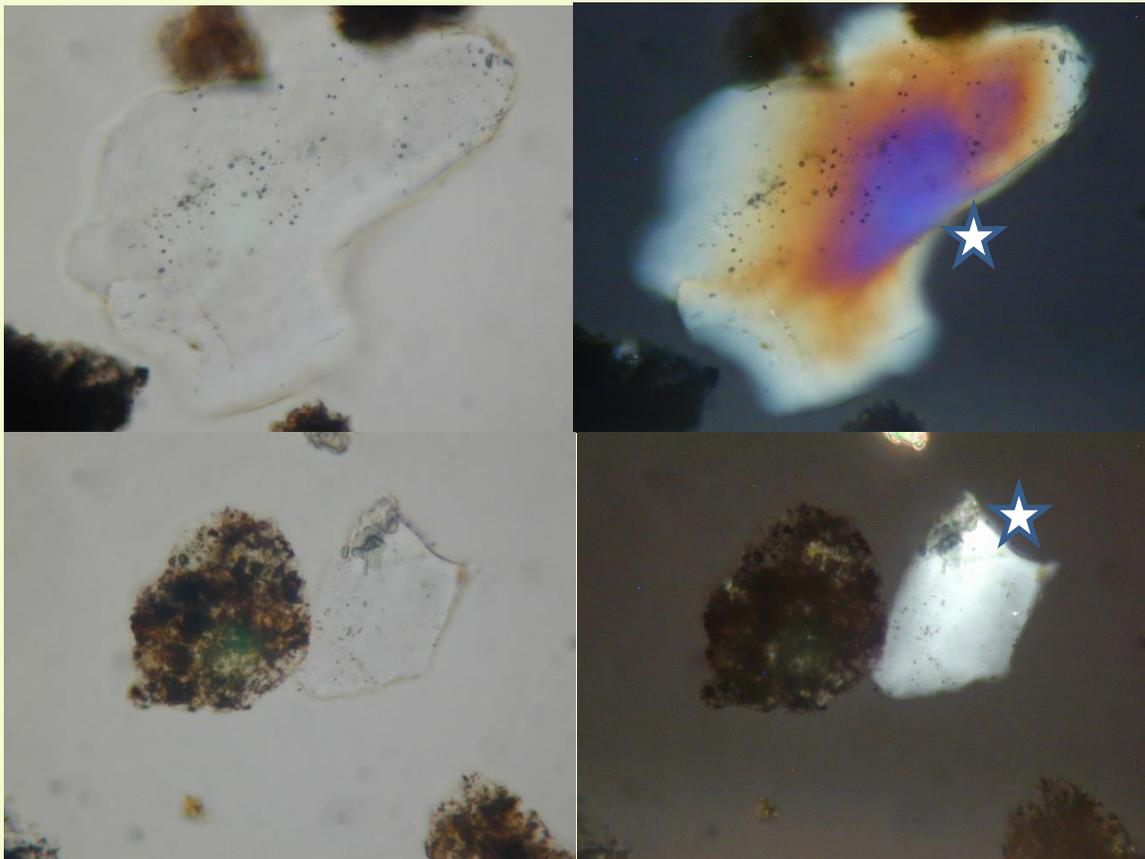
And for good measure....



The glass in your Saratoga Sites samples includes a very small amount of fiberglass (<1%), but that is not the material identified in these photomicrographs. I gave you an example of clearly distinguishable fiberglass found in your 5 December 2020 sample with a much greater amount of bubbly expanded shale matrix glass.

I mentioned that there were quartz shards at a higher incidence than in your previous sample. Below are some examples of quartz shards where the optically active material (bright on the right) is the quartz. These shards are on the large end of the size distribution present, which ranges down to ~micron sized, below which I lose optical

resolution. A rough census is that the range of the quartz particles constitutes 5-20% of various samples. A useful feature of the optically polarizing microscope is the ability to contour sample thickness by noting the contours of color fringes in X-polar mode. So in the first image pair, the color contours go from dark grey, light grey, yellow, orange, red, to purple as one proceeds from the outer edge to the interior of the grain. This sequence of colors corresponds to increasing mineral thickness. For most of the perimeter of this shard, the dark grey edge feathers out into the darkness of the immersion oil, except in the region of the star where the purple fringe just drops straight off into the oil. The dark grey feathering out into the oil physically means that the thickness of the shard is gradually approaching zero as you proceed to the margin of the shard. Translation: this grain has an exquisitely sharp edge – except for the region near the star where the thickness of the sample falls off a cliff to make a locally blunt edge. This sharpness is characteristic of the quartz particles in Ed's attic and on your windshield. The second pair of quartz shard images shows the same sort of phenomenon but the whole shard is smaller and thinner, with a blunt cliff near the white star and a sharp, feathered edge on the rest of the perimeter.



In the preparation of biological samples for microscopy by sectioning with a microtome, broken glass razors are the sectioning instrument of choice. The conchoidal fracture of both glass and quartz is the feature that makes the necessary edge sharpness possible. Your dust has both razor-sharp quartz and sharp, pointy glass to contribute to the inventory of surgical-grade, lacerating particles available from Norlite for inhalation.

Think a cloud of Murano glass micro-knives in your tender tissues. This is not desirable. But just how dangerous is it?

One has only to refer [www.norliteagg.com/norliteMSDS.pdf] to the MSDS on Norlite's website for their own assessment of this material. They list as problems both acute and chronic toxicity from the crystalline silica (quartz). Crystalline silica causes silicosis, a "...progressive, incurable lung disease that is typically fatal." Your dust has fresh shards of quartz with very fresh sharp edges in a wide range of particle sizes. The Norlite MSDS makes no mention of the silica-rich glass, which forms the matrix of the expanded aggregate and contributes a wealth of additional sharp, pointy lacerating particles to the dust found at Saratoga Sites and its neighborhood. Volcanic glass of this sort is also a known cause of silicosis and related pulmonary problems. There are no volcanos in the neighborhood to contribute the glass found in your dust. This glass and quartz comes from the Norlite aggregate. It is toxic dust by Norlite's own admission. These facts are freely available on the public websites cited and are not in dispute. These facts are under-appreciated in the community. I hope you will be able to take precautions against continued exposure to this material.

Best regards,

A handwritten signature in black ink, appearing to read "David Walker", with a long, sweeping horizontal stroke at the end.

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e.c.

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