Thank you to Mickey Huff and KPFA radio for hosting the Twin Towers debate on the tenth anniversary of September 11. Richard Gage and Niels Harrit described hard evidence for the controlled-demolition hypothesis; Dave Thomas and Richard Muller promoted the fire-induced collapse hypothesis. Listen to the entire debate at http://www.kpfa.org/archive/id/73245 .

Richard Gage, AIA is a San Francisco Bay Area architect and founder of AE911Truth—a nonprofit organization with over 1,600 professional architects and engineers plus over 13,000 others who are calling for a science-based investigation of the destruction of the three high-rise buildings. [1]

Dr. Niels Harrit, associate professor emeritus of chemistry from the University of Copenhagen, has published over 60 peer-reviewed papers in scientific journals including "Active Thermitic Material Discovered in Dust from the 9/11 World Trade Center Catastrophe." [2]

Dave Thomas, physicist and mathematician, has been researching 9/11 conspiracy theories since 2009. He is president of New Mexicans for Science and Reason and a fellow of the Committee for Skeptical Inquiry. [3]

Dr. Richard Muller, professor of physics, has a long resume of research and academic appointments at UC Berkeley, the Lawrence Berkeley Laboratory and the Space Sciences Laboratory. Dr. Muller is well known for his book Physics for Future Presidents—the Science Behind the Headlines (2008). [4]

Dave Thomas started by framing the debate in a political context with a statement supporting an investigation—into the rationale for the Iraq War. He categorically denied empirical evidence of explosions stating "…there was no boom, boom, boom that you always hear…" Apparently Thomas has never read eyewitness accounts of first responders in the FDNY Oral Histories [5] ; he has never heard exhausted and bleeding firefighters describing explosions on video released by the National Institute of Standards and Technology (NIST) to the International Center for 9/11 Studies
[6]
. Thomas's opinion—that the Towers' unique design was vulnerable to catastrophic collapse following aircraft impact and fire—was not supported by science. The Structural Engineer of Record, John Skilling, understood the design and construction of the towers when he stated (after the first demolition attempt in 1993) that the "building structure would still be there." Skilling knew the Towers were designed to withstand the impact of a Boeing 707 without a catastrophic failure.
[7]

Gage's introductory statement emphasized that the official account is a grand conspiracy theory for which there is little evidence. Key points made by Gage include: NIST has repeatedly

denied the existence of relevant evidence in its seven-year study; NIST concluded the collapses were due to impact and fire damage, and no explosives were present; NIST, however, never tested for explosives residues. Esteemed scientist Dr. Lynn Margulis, recipient of the President's Medal of Science and the Da Vinci Award, agrees:

So this is what NIST has done, denied and ignored crucial evidence. It doesn't fit their preconceived notions. [8]

Dr. Muller's introductory statement was intended to stick to the physics, and his reaction to seeing the Towers collapse was "Oh—of course." He may be the first person on record who was not surprised upon seeing two massive 110-story office towers each dissolve into an avalanche of debris. Muller proceeded to explain why he expected the Twin Towers to collapse:

Gasoline, the reason we use it, the reason we love it is because it has so much energy.

I see nothing to love about the destructive energy displayed on 9/11. Muller continued with a brief introduction to engineering mechanics as it applies to high-rise building destruction by fire:

These columns are designed to hold up twice as much weight as they actually hold, but once they lose half of their strength they are bound to buckle…Once a column buckles—take a soda straw and squeeze it between your hands...

Did it ever occur to Dr. Muller that there may be structural engineers listening who know the difference between buckling of steel columns and buckling of plastic drinking straws, and some listeners may find this analogy offensive? The modulus of elasticity of steel is roughly 100 times that of plastics used for drinking straws, and the slenderness ratio of a drinking straw is roughly three times the slenderness ratio of a perimeter column in the upper stories of the WTC. You could not buckle the same straw by hand if it was made of steel.

Typical columns may be designed with a safety factor of approximately two. The columns of the

Twin Towers, however, were not typical columns. They were designed to equalize axial stresses and column shortening during construction due to their extreme height. This enabled the high-strength steel perimeter columns to have much greater reserve capacity than "typical" columns. An Engineering News Record article from July 8, 1965 stated:

A design procedure that will be used for structural framing of the 1,350-ft high twin towers of the World Trade Center in New York City gives the exterior columns tremendous reserve strength. Live loads on these columns can be increased more than 2,000% before failure occurs…Exterior columns will be spaced 39 inches c-c. Made of various high-strength steels, they will be 14-inch square hollow-box sections, for high torsional and bending resistance, and windows will be set between them. Spandrels welded to the columns at each floor will convert the exterior walls into giant Vierendeel trusses…Thus, the World Trade Center towers will have an inherent capacity to resist unforeseen calamities. This capacity stems from its Vierendeel wall system and is enhanced through the use of high-strength steels. [9]

For some reason Dr. Harrit was not given a three-minute statement of introduction. His one-minute rebuttal emphasized the importance of historical precedent and observation in science. Fire has never caused a steel-frame high-rise building to collapse prior to 9/11, and the energetic jet fuel was quickly consumed in the initial fireball and the first few minutes of fire. Fuel was primarily office furnishings. So how do burning desks and papers create molten-iron residues discovered in abundance in the debris? [10]

Gage's second statement explored the collapse of WTC7 and David Chandler's measurements of free-fall acceleration. NIST has admitted free fall, but has yet to provide any rational explanation for this. [11] An important question was raised: What happened to the column resistance to allow free-fall motion to occur?

Column buckling requires energy, and deforming steel beyond the elastic range dissipates energy. But free fall—or gravitational acceleration—converts gravitational potential energy to kinetic energy with nothing left to perform the mechanical work required to squash a structural steel frame supporting 40 stories. Additional energy was required to overcome the resistance of structural elements. Dr. Sunder of NIST acknowledged this during the technical briefing held on August 26, 2008 as he attempted to answer Chandler's question: "*How can such a publicly visible, easily measurable quantity be set aside?*
"
[12]

Dr. Sunder's response included:

…a free-fall time would be an object that has no structural components below it…

…you had a sequence of structural failures that had to take place, and everything was not instantaneous.

Unfortunately none of these comments were acknowledged in the final NCSTAR reports issued in November 2008. There was clearly no rational explanation in the final reports for the observed free-fall motion.

Thomas's rebuttal addressed the question of free fall by invoking the NIST report's three-stage collapse. [13] Anyone can see that the global-collapse simulation of WTC 7 does not correlate to the video documentation. There is no video or photographic evidence showing stage one—allegedly a buckling failure of 58 perimeter columns within two seconds.

Dr. Harrit emphasized the inadequacy of the NIST three-stage collapse progression. The global-collapse simulation of WTC 7 does not demonstrate the observed motion, so there's no compelling reason to accept the NIST conclusions.

Dr. Muller's rebuttal consisted of more mechanics of buckling.

I really recommend members of the audience take a sheet of paper, 8x10, roll it into a cylinder, put a little scotch tape on it and then put it on its end and put a book on top. It's amazing that paper can hold up a book. Then put a second book on top, then a third and add them up until the thing collapses. You'll find that when it collapses, it doesn't take energy, it doesn't take time. The whole thing collapses very suddenly. This is the nature of buckling. It doesn't take very much energy, and it is very fast.

I tried Dr. Muller's experiment with a sheet of paper rolled into a cylinder 8.5 inches long and about 3.5 inches in diameter. The third book crumpled the cylinder and flattened it in a blink. A second experiment with the paper rolled to about two-inch diameter required four books to crumple one end, and the cylinder collapsed to one side. Both experiments can be described as local-buckling failures of thin-walled cylinders.

What does this say about structural steel columns in the lower stories of a 47-story building? Nothing, other than buckling is a real failure mode that must be considered in the design of columns, and don't try supporting buildings of any size on paper cylinders. To imply buckling of

steel columns takes little energy is nonsense. Columns require excessive strain energy due to applied axial load before they can reach their critical buckling strength. There was no excess weight straining the columns of WTC 7 on the afternoon of 9/11, so why should 58 perimeter columns and 24 interior columns all buckle roughly simultaneously?

Thomas claimed that WTC7 had "huge fires that raged for seven hours" referring to the period between 10:30 a.m. when the North Tower collapsed and 5:20 p.m. when WTC 7 collapsed. Gage stated correctly that this claim is grossly exaggerated as the photographic record proves. The earliest visual evidence showing flames in WTC 7 is a video clip of the southwest corner recorded after 12:00 p.m. [14] The northeast corner of WTC 7 was photographed at around 4:00 p.m. NIST says "… *there is no indication of fires burning on the east side of the 12th floor at this time* ." [15] The north face at floors 10 through 14 was also photographed at around 4:38 p.m. In NIST's words " *All of the visible windows on the 12th and 13th floors are open in Figure 5-149. There is no indication of fire at these locations on either floor* ."
[16]
Indeed, all the windows appear dark where the NIST fire simulation indicated raging fires. Thomas's claim is easily disproven by reading NCSTAR 1-9 Chapter 5.

On one hand Thomas favors the NIST report, and on the other hand he indicated that some building professionals have disagreed with the NIST draft report. What Thomas did not say was that most of the public comments submitted to NIST were ignored. [17] Free fall, however, was not ignored for good reasons stated previously. How many building professionals have embraced NIST's final reports?

Dr. Muller continued with the structural engineering lessons:

…buildings are like houses of cards…They are made lightweight on purpose so that you don't have to have a huge structure at the bottom to hold it up…

What? Buildings are like houses of cards? This is not what I recall learning in the College of Engineering at UC Davis or in 25 years practicing structural engineering. What would the UC Structural Engineering professors say about Muller's characterization of structural design principles? Fortunately he added:

…these things [the Twin Towers] *are really solid at the bottom too.*

Observing scientific principles, Dr. Harrit stated facts regarding the Cardington fire tests performed in the UK where unprotected steel beams achieved temperatures of up to 1,150° Centigrade without failure. [18] Steel samples from the fire-affected floors of the Twin Towers were tested by NIST but reached only 250 degrees Centigrade. [19]
The highest column temperatures in WTC 7 were estimated at 300 degrees Centigrade [20]
—not hot enough to weaken steel.

Gage's statement regarding molten steel, iron microspheres and extreme temperatures [21] was clear and concise. Anyone listening who was not already familiar with this evidence would be alarmed. Thomas, far from being alarmed, simply dismissed the molten steel as molten aluminum from the aircraft or building exterior cladding.

Thomas claimed the chemical signature of thermite (a mixture of iron oxide and aluminum) was *not* found in the WTC dust. His "explanation" for the energetic red-gray chips found by Dr. Steven Jones was that they were primer paint from open-web steel trusses used in the original construction of the towers. The research done by Harrit and others tested this possibility, and the chips were not red-oxide primer paint. [22]

Readers who have come this far should now have a sense of the nature of this debate. The conclusion will be left for listeners to discover at http://www.kpfa.org/archive/id/73245 , and I will close this discussion with a few words about Dr. Muller's book mentioned previously.

Physics for Future Presidents—the Science Behind the Headlines, Chapter One, briefly discusses aircraft impact, energy contained in the jet fuel, and the "sledgehammer" effect crushing the intact structure floor by floor. His hammer-and-nail analogy, however, does not explain the lack of deceleration at the moment of floor impact—otherwise known as the missing jolt. [23] A brief and tenuous theory for the collapse of WTC 7 concludes Chapter One, and it does not even mention free fall.

When the building [WTC 1] *collapsed, it brought down with it whatever jet fuel had not yet been consumed. The continued burning of this fuel caused the collapse (again, because of weakening of columns) of the nearby Building 7.*

The FEMA 403 report, however, states:

...it is believed that almost all of the jet fuel that remained [following the initial fireball] on the impact floors was consumed in the first few minutes of the fire. [24]

This makes sense. And NIST NCSTAR 1-9 states:

…exterior columns and core columns [of WTC 7] also did not heat significantly on the fire floors. [25]

How—after 103 minutes of fire in WTC 1—was there enough jet fuel remaining to bring down WTC 7? And how could scattered fires on several floors cause a complete collapse at free-fall acceleration? This defies common sense. Future presidents and alert citizens deserve an honest explanation that meets strict standards for scientific integrity.

Thank you to all participants in the Twin Towers debate for an enlightening hour. With all due respect for their accomplishments, if Dave Thomas and Richard Muller are the most qualified proponents for the fire-induced collapse hypothesis put forth in the NIST reports, then I'll continue studying the science and standing with Richard Gage and Niels Harrit.

Ronald H. Brookman, SE

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[1] See http://www.ae911truth.org .
[2] See http://nielsharrit.org .
[3] See http://www.nmsr.org .
[4] See http://muller.lbl.gov .
[5] See http://graphics8.nytimes.com/packages/html/nyregion/20050812_WTC_GRAPHIC/met_WTC_histories_full_01.html .
[6] See http://www.youtube.com/user/IC911STUDIES#p/u/5/IO1ps1mzU8o .
[7] See http://community.seattletimes.nwsource.com/archive/?date=19930227&slug=1687698 .
[8] See http://www.youtube.com/watch?v=g-GFBEX5bjY .
[9] See http://911research.wtc7.net/mirrors/guardian2/wtc/eng-news-record.htm .
[10] Steven E. Jones et al., "Extremely High Temperatures during the World Trade Center Destruction", Journal of 9/11 Studies, Volume 19, January 2008. See http://journalof911studies.com/articles/WTCHighTemp.pdf
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[11] S. Shyam Sunder et al., NIST NCSTAR 1A, Final Report on the Collapse of World Trade Center Building 7 , Washington: U.S. Government Printing Office, November 2008, p. 45.
[12] See http://www.youtube.com/watch?v=eDvNS9iMjzA&list=PL206C1F5EDFC83824&index=1 .
[13] Sunder et al.
[14] Therese P. McAllister et al., NIST NCSTAR 1-9, Structural Fire Response and Probable Collapse Sequence of World Trade Center Building 7
, Washington: U.S. Government Printing Office, November 2008, p. 194.
[15] NCSTAR 1-9, Fig. 5-141, p. 227.
[16] NCSTAR 1-9, p. 235.
[17] See http://www.nist.gov/el/disasterstudies/wtc/upload/combined2008publicComments-2.pdf .
[18] See http://911research.wtc7.net/mirrors/guardian2/fire/cardington.htm .
[19] Frank W. Gayle et al., NIST NCSTAR 1-3, Mechanical and Metallurgical Analysis of Structural Steel , Washington: U.S. Government Printing Office, September 2005, p. xli.
[20] Sunder et al., p. 21.
[21] Jones et al.
[22] Harrit et al.
[23] Graeme MacQueen and Tony Szamboti, "The Missing Jolt: A Simple Refutation of the NIST-Bazant Collapse Hypothesis", Journal of 9/11 Studies, Volume 19, January 2008. http://journalof911studies.com/volume/2008/TheMissingJolt7.pdf .
[24] Ronald Hamburger et al., FEMA 403, Ch.2, "WTC 1 and WTC 2", p. 2-22.
[25] NCSTAR 1-9, p. 394.