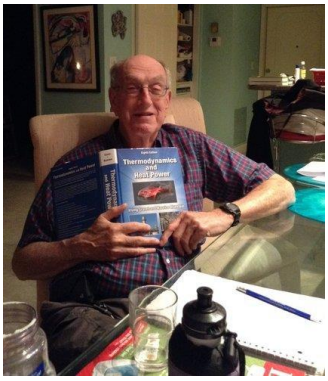
TEMPERATURE & HEAT

Unit 20 Dr. John P. Cise, Professor of Physics, Austin Community College, Northridge Campus, Austin Tx., jpcise@austincc.edu & NYTimes 9/14/17 by Amisha Padnani

---

Maurice Bluestein, Who Modernized the Wind Chill Index, Dies at 76



INTRRODUCTION: **Dr. Bluestein in 2001 came up with a better methodology to find the wind chill temperature. The formula he developed is seen below in the article. WCT = will chill temperature, T = Fahrenheit temperature, V = wind speed in mph, Note V is raised to the exponent of 0.16.**

QUESTION: **The US weather service produced the wind chill temperature table For various wind speeds and REAL temperatures. (a) Using the WCT formula, find the WCT for T = 20° F and V = 25 mph ? , (b) How close did the computed WCT come to the value for the WCT for T = 20° F & V = 25 mph in the US weather service table below?**

ANSWERS: **(a) WCT = ~ 2.14 F°, (b) WCT table says WCT = ~ 3° F. Thus computed value close.**

Maurice Bluestein in 2014 with a textbook he helped write, "Thermodynamics and Heat Power."

On frigid winter mornings, when weather forecasters are trying to describe whether it's a hat-scarf-gloves day or if just a warm coat will do, they will take **the temperature (T) and wind speed (V) and plug the numbers into a handy equation:**

$$WCT = 35.74 + 0.6215T - 35.75V^{0.16} + 0.4275TV^{0.16}.$$

The result is the wind chill index, a number that attempts to tell us how cold it might feel rather than simply how cold it is. It considers wind, in addition to temperature, to calculate the loss of heat from the body.

The National Weather Service had been calculating the wind chill since the 1970s, but not very accurately, until two scientists **set out in 2001 to perfect the measure and make it more reliable.** One of the two was Maurice Bluestein, who died at 76 on Aug. 28 in Pompano Beach, Fla., where he lived. Dr. Bluestein, who was **trained as a mechanical engineer,** had not given much thought to the science behind the weather until he was shoveling out his daughter's car from under a snowdrift one evening in January 1994 in Indianapolis. "The old system scared people into taking unnecessary actions," Dr. Bluestein told The Wausau Daily Herald in Wisconsin 2001. "There are schools, for instance, that close at certain wind-chill temperatures when perhaps they shouldn't be closed." Dr. Bluestein ruminated over the problem for several years, until he went to a conference and met Randall Osczevski, a Canadian scientist, who had also been questioning the wind-chill formula. The two began studying wind chill and wrote papers about their findings, drawing the attention of both the United States and Canadian governments in 2001. After plotting the data, they found that in some cases the original wind chill index was off by just a few degrees, but that the discrepancy grew at higher wind speeds. It confirmed what many meteorologists had already suspected: The old calculation had exaggerated.

Wind Chill Chart

Temperature (°F)

Wind (mph)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3		-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1			-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14		-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29		-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37			-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52		-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68		-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76		-91	-98

Frostbite Times 30 minutes 10 minutes 5 minutes

Wind Chill (°F) = 35.74 + 0.6215T - 35.75($V^{0.16}$) + 0.4275T($V^{0.16}$)

Where, T= Air Temperature (°F) V= Wind Speed (mph) Effective 11/01/01

Wind Chill Temperature WCT = ~ 3° F

When Real temperature is T = 20° F & V = 25 mph