

# The Teletherm

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Principles of Complex Systems, Vols. 1, 2, & 3D  
CSYS/MATH 300, 303, & 394, 2022-2023 | @pocsvox

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Santa Fe Institute | University of Vermont



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Groundhog Day  
Solstices  
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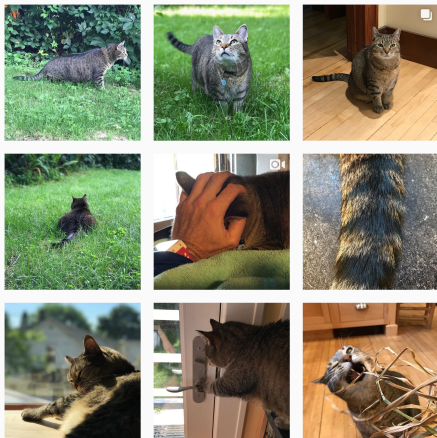
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## Special Guest Executive Producer



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 On Instagram at [pratchett\\_the\\_cat](https://www.instagram.com/pratchett_the_cat) 



# Outline

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Groundhog Day

Groundhog Day

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## The existential temporal escape room:



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# Groundhog day story things:

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-  Time loop movies achieves [Wikipedia list status](#) 
-  Also basically every video game is a Groundhog day situation.
-  Trope with Trope Namer action:  
["Groundhog Day" Loop](#) 
-  Phil Connors went through the temporal wringer for [maybe 30 to 40 years](#)  ...
-  Groundhog Day the Musical: Excellent.
-  2017-08-08: Bill Murray went to the see the musical on the opening night, unannounced. Took photos with the cast afterwards.
-  And then went to see it again on the [second night.](#) 

[Groundhog Day](#)

[Solstices](#)

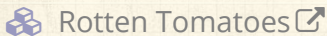
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## The reviews:



Rotten Tomatoes

### GROUNDHOG DAY

PG 1993, Comedy/Romance, 1h 36m



**97%**

TOMATOMETER  
86 Reviews



**88%**

AUDIENCE SCORE  
250,000+ Ratings







"Generally favorable" according to metacritic:

60 to 90



## End points:

 A 90 rating  on Metacritic from the Washington Post:  
"With a script as beautifully complex as this one, Ramis and his cast have half of their work done for them. There is a moral to the tale as well, and it even strikes an uplifting note. But, for once, the audience isn't forced to surrender its intelligence (or its healthy cynicism) to embrace the film's sunny resolution."

 A 60 rating  on Metacritic, somehow also from the Washington Post:  
The trouble is, you'll feel like you've been through too many same days yourself. With its zany daily episodes, "Groundhog" gets stuck in a non-progressive repetition.'

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# Living in the Big Tick Tock:

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Predictable photon delivery:


 Solstice  = "Sun + stand still"



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## Solstices have some complications:



- June 20/21-ish: Northern hemisphere's estival solistice and the Southern hemisphere's hibernal solstice.
- December 21/22-ish: Northern hemisphere's hibernal solistice and the Southern hemisphere's estival solstice.
- But because of tilts and ellipses the earliest and latest sunrises and sunsets  don't happen on the solstice.
- Earliest sunset in Burlington, Vermont?  
4:12 pm, December 9, 2021
- Latest sunrise in Burlington, Vermont?  
7:29 am, December 30, 2021–January 9, 2022
- Varies across latitudes and planets.


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# Cherry blossoms: The 12 hundred year data set

 WaPo, 2017: Japan's cherry blossoms signal warmest climate in more than 1,000 years 

 WaPo, 2021: Japan's Kyoto cherry blossoms peak on earliest date in 1,200 years, a sign of climate change 

 Data: <http://atmenv.envi.osakafu-u.ac.jp/aono/kyophenotemp4/>

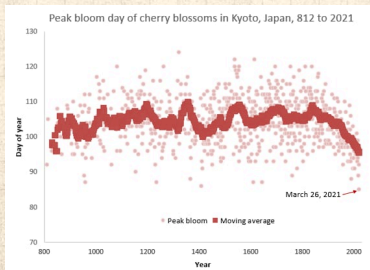
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## First leaves:

Finding the same trend towards earlier seasons, but detected using a different method—the date of first leaves in spring—and across the entire northern hemisphere:



[“Onset of spring starting earlier across the Northern Hemisphere”](#) ↗

Schwartz, Ahas, and Aasa,  
Global Change Biology, **12**, 343–351,  
2006. [2]

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## From found 2009 notes:

- ☞ Frigistice (winter) and Thermistice (summer)
- ☞ Conflation of measurable with important (delicate) Importance of statistical measurements. Appreciation of randomness, good to encode. The teletherm. Solstice.
- ☞ I propose that the statistically coldest and warmest days of the year be known as the teletherms, and that these days should be recognized. The word teletherm derives from the Greek roots for end or terminal (telos-) and heat (-therm), in analogy with solstice (Latin for sun-stop). The hibernal teletherm falls roughly on January 31, and the esteval teletherm on July 31.
- ☞ The solstices and equinoxes have been celebrated by human civilizations for thousands of years, and their measurement
- ☞ Equitherms.
- ☞ Groundhog day!!! February 3
- ☞ July 17 (July 16 in a Leap Year)
- ☞ January 25 = day when 50% of years have experience their coldest day for the winter.
- ☞ thermological winter
- ☞ Imbolc one of the cross-quarter days, halfway between the winter solstice and the vernal equinox
- ☞ Candlemas

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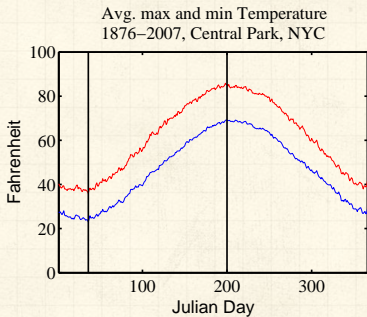
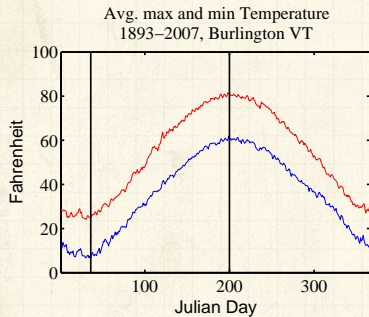
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# The Teletherm, an early conception:



- 🧱 Hibernial Teletherm  $\approx$  February 4.
- 🧱 Halfway between Winter Solstice and Spring Equinox
- 🧱 Bonus: [Groundhog Day](#) ↗, [Imbolc](#) ↗, ...
- 🧱 Aesteval Teletherm  $\approx$  July 19 (164 days later).

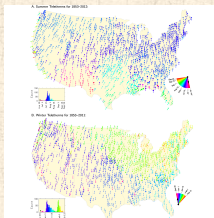




“Tracking the Teletherms: The spatiotemporal dynamics of the hottest and coldest days of the year”

Dodds, Mitchell, Reagan, and Danforth.

PLoS ONE, **11**, e0154184, 2016. [1]



Explore Teletherms online at <http://teletherm.org>



The wrongness: 6000 Figures/300MB of Supplementary Information.



Follow [@teletherm](https://twitter.com/teletherm)

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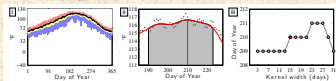
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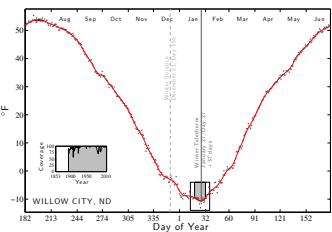
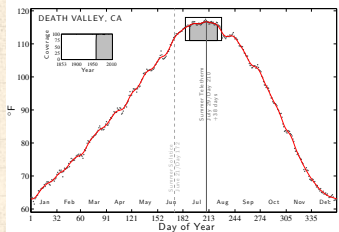
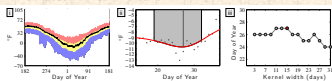
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**A. Hottest Summer Teletherm:**

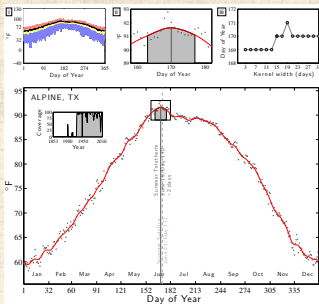


**B. Coldest Winter Teletherm:**

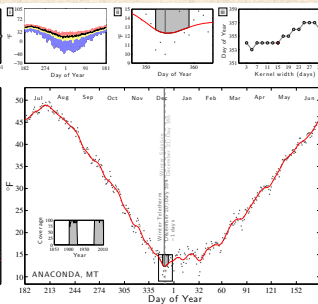




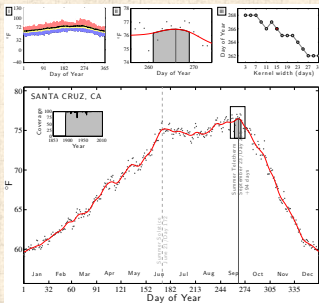
A. Earliest Summer Teletherm:



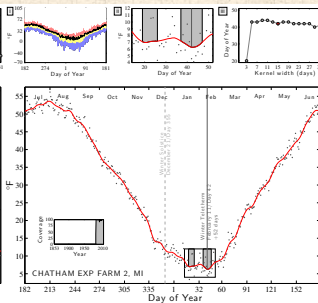
B. Earliest Winter Teletherm:



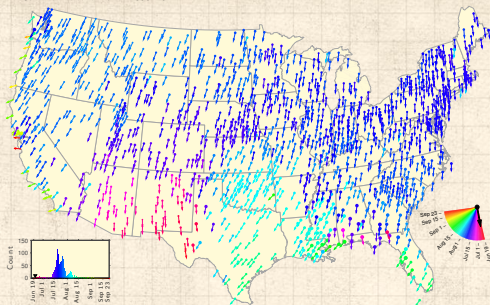
C. Latest Summer Teletherm:



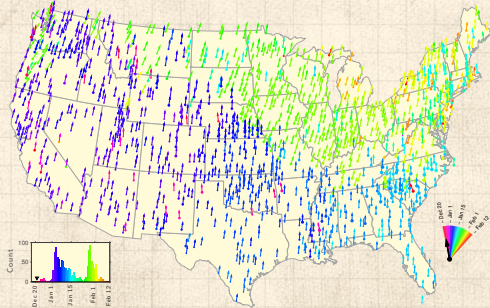
D. Latest Winter Teletherm:



A. Summer Teletherms for 1853–2012:



B. Winter Teletherms for 1853–2011:

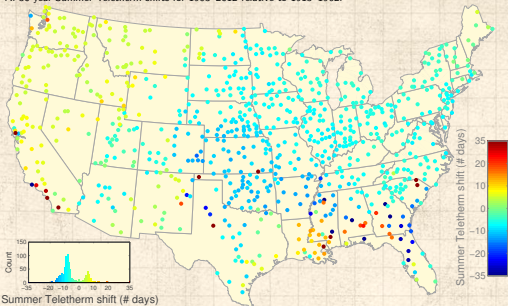


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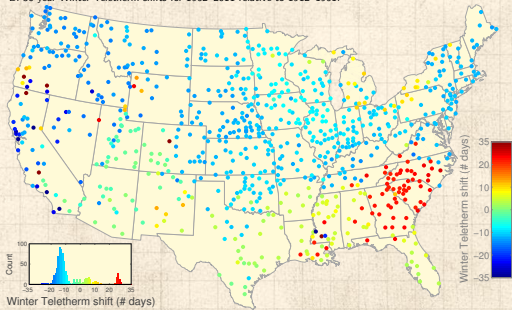
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A. 50 year Summer Teletherm shifts for 1963–2012 relative to 1913–1962:



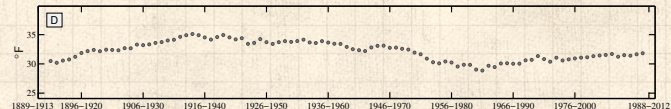
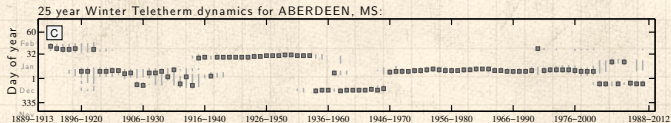
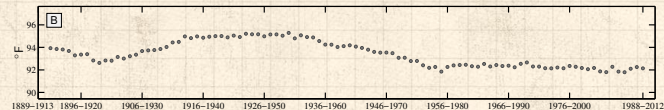
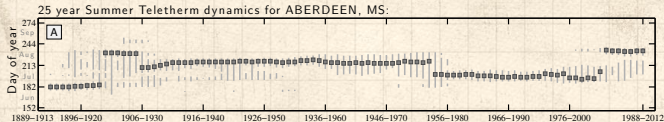
B. 50 year Winter Teletherm shifts for 1962–2011 relative to 1912–1961:



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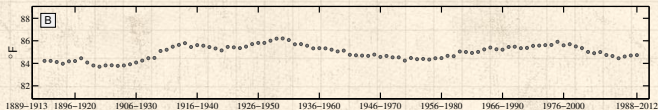
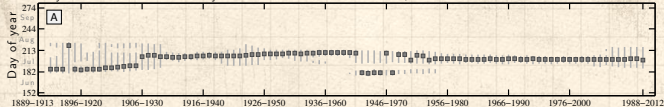




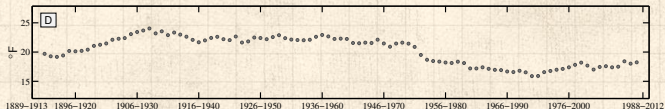
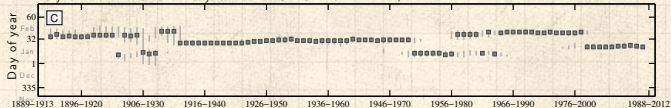
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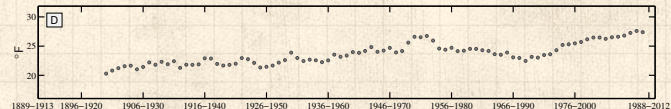
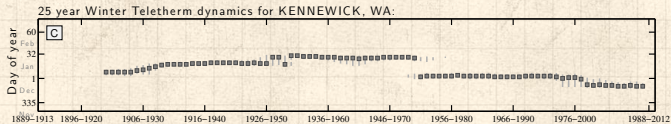
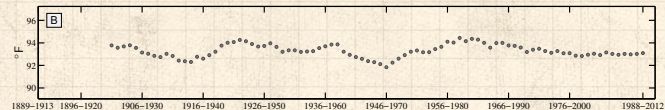
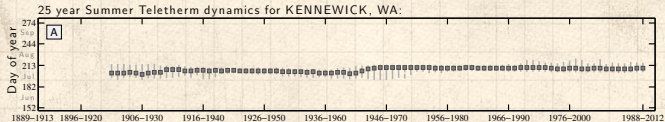


25 year Summer Teletherm dynamics for UNIONTOWN 1 NE, PA:



25 year Winter Teletherm dynamics for UNIONTOWN 1 NE, PA:








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## Unfinished work:

 Teletherm switching.

 The full site [teletherm.org](http://teletherm.org)  and a paper.

# References I

- [1] P. S. Dodds, L. Mitchell, A. J. Reagan, and C. M. Danforth.  
Tracking the Teletherms: The spatiotemporal dynamics of the hottest and coldest days of the year.

[PLoS ONE, 11:e0154184, 2016. pdf](#) 

- [2] M. D. Schwartz, R. Ahas, and A. Aasa.  
Onset of spring starting earlier across the Northern Hemisphere.

[Global Change Biology, 12:343–351, 2006. pdf](#) 