Something with ‘W’

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They all have a W

The directors of Zürich Observatory were:

1864-1893 Johann Rudolf Wolf (1816-1893)
1894-1926 Alfred Wolfer (1854-1931)
1926-1945 William Otto Brunner (1878-1958)
1945-1979 Max Waldmeier (1912-2000)

So, I shall talk about them. And tomorrow you’ll hear a lot more, so be there…
Johann Rudolf Wolf

1849: begins regular observations of sunspots
1852: publishes first list of historical sunspot observations back to 1610 in ‘Mittheilungen’ and establishes that the length of the sunspot cycle is 11.11 years
1856: discovers the relationship between sunspots and variations of ‘the magnetic needle’
1857: compiles catalog of northern lights
1858: devises the Wolf Number $R = 10G + S$
1859: puts forth the Planetary Hypothesis (that planets cause of modulate solar activity)
‘External’ Control of Solar Activity?

• Rudolf Wolf noted that the length of the cycle was close to the orbital period of Jupiter.

• From time to time since then [even today], the idea has been put forward that the planets create/control/modulate the solar cycle.

• Even galactic ‘influence’ is sometimes called for (not discussed here).
Rudolf Wolf’s Attempt in 1859

\[ R = 50.31 + 3.73 \left[ 1.68 \sin(586.26^\circ t)\{\text{Venus}\} + 1.00 \sin(360.00^\circ t)\{\text{Earth}\} + 12.53 \sin(30.35^\circ t)\{\text{Jupiter}\} + 1.12 \sin(12.22^\circ t)\{\text{Saturn}\} \right], \]

where \( t \) is years from 1834.50. The angles are degrees per Earth-year. The coefficients are mass/distance-squared. [Tidal effects are mass/distance-cubed]

At the end of his life [1893] Wolf remarked that this research (by him and others) never produced any really satisfactory results
Wolf’s Important Discovery

\[ rD = a + b \ R_w \]

A current system in the ionosphere is created and maintained by solar FUV radiation.

The current has a magnetic field of its own which is readily observed on the ground even with 18th Century technology.

The amplitude \([rD]\) of this variation is a proxy for FUV.
Recording Variations of the Geomagnetic Field
Amplitude Varies with Solar Zenith Angle and Solar Activity

Diurnal Variation of Declination at Praha (Pruhonice)

Diurnal Variation of Declination at Praha

1957-1959
1964-1965
1840-1849
rD
Putting the discovery to work

Variations of F10.7 microwave flux and Ca II K-line index (and thus solar activity) track the Diurnal Variation of the Geomagnetic Field.
Johann Rudolf Wolf

1861: publishes list Relative Sunspot Numbers for 1749-1860

1876: hires assistants Billwiller and Wolfer

1878: corrects the 1861 list, increasing all pre-1849 Relative Number by 25% based on the ‘magnetic needle’ data

1884: publishes a list of Magnetic Needle Variation for 1781-1880

1893: makes his last observation on 31 October, 37 days before his death, completing 47 years of observing
Alfred Wolfer

1876: disagrees [rightly] with Wolf and insists on counting all spots he can see, not omitting the smallest spots. This makes it necessary to apply a correction factor of 0.6 to match Wolf’s scale.

1902: lowers Wolf’s Relative Sunspot Numbers for solar cycle 5 (1798-1810); in effect, creating the Dalton Minimum.

1923: stops publication [and use] of geomagnetic variations [they didn’t fit anymore --- the Earth’s magnetic field is changing].

1926: continued the publication of ‘foreign’ observations, begun by Wolf in 1852.
William Otto Brunner

I couldn’t find a photo of Brunner, but here is one of the crater on the moon named after him.

Brunner stopped publication of ‘foreign’ observations, making it harder to get at the raw data.
Max Waldmeier

1940: begins synoptic observations of the Green Corona (530.3 nm)

1945: stops publication of raw data altogether making it VERY hard (impossible?) to verify the construction of the sunspot number

1947: begins to weight large spots more than small spots in the count, thus inflating the Zurich number by 20% [continues to this day]

1957: recognizes [and coins the term] Coronal Holes

1971: finds a very tight relationship between the F10.7 solar radio flux and the sunspot number and realize that this can be used to calibrate the Sunspot Number

1996: continues observations long after the official hand-over to SIDC in Brussels in 1980
The ‘Rush’ to the poles

Measurements of the location of ‘peaks’ of Fe XIV coronal emission at 503 nm (the ‘Green Line Corona’) over 7 solar cycles. The plots show the probability of observing a ‘peak’ at a given latitude as a function of time.

Altrock, 2011

TO: Hill, 2011
Fold South unto North

The Extended Cycle [if any] is not very clear
“It’s The Sun, Stupid”

“She was mocking the idea, though

"The Sun could account for as much as 69% of the increase in Earth's average temperature"
The Climate Debate has reached absurd heights

Global warming is making the world colder

Researchers believe the disappearing Arctic ice is sending more water vapour into the air, and is interfering with atmospheric currents and westerly winds that would typically have swept snowy weather northward. An iceberg off Ammassalik Island in... FULL ARTICLE AT ADELAIDE NOW

Two Ws in the above
Important to get the Sunspot Number correct

This assumption has been invalidated by the last decade’s observations

More tomorrow…