AWA Newsletter

102

July 2014

A Member of the SARL

Antique Wireless Association of Southern Africa

Inside this issue:

AWA Committee:

- President—Ted ZS6TED
- Technical Advisor—Rad ZS6RAD
- Secretary/PRO—Andy ZS6ADY
- Western Cape—John ZS1WJ
- KZN—Don ZS5DR

Reflections:

By the time this Newsletter goes out, I will be packed and ready to head off to the UK for 3 weeks.

Of course this has prompted me to get the Newsletter out on time for a change, so all will have benefitted from it.

Since the inception of our website, their has been quite an influx of new members to the AWA who have sent in subscriptions for the Newsletter.

Of course one thing we have to remind you all is, membership of the AWA is by association, so like it or not, if you associate with us, you get classed as a member.

In the past few months there have been a few of the email addresses that keep coming back as address unknown, so I have removed a few from the list and then added the new members I their place.

As it stands at the moment our membership has grown to 170. For a club that has no membership fees and no real infrastructure, this certainly is not bad at all.

Welcome to the new members who have signed up via the website and we look forward to many more joining up with us.

I am sure you will all agree with me, the website certainly is a big bonus for the AWA. Please do not hesitate to use the various facilities on the website and we hope it will become something that is used at least once a day by each member either looking for information or disposing of equipment.

The website will cost us about R1000 a year to keep going, which in the light of our finances at the moment is not a problem, thanks to the various donations in rigs that have been made and sold off at flea markets.

I want to appeal to those of you who receive the Newsletter by snail mail. If you do have an email address, please consider changing over to an emailed version to help us save on postage, envelopes and paper.

I look forward to seeing more people joining us over the next year as there seems to be no shortage of valve rigs in SA and no shortage of operators willing to restore them and keep the heritage going.

Keep them glowing.

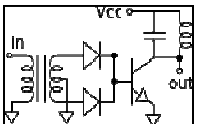
Best 73

DE Andy ZS6ADY

WIKIPEDIA

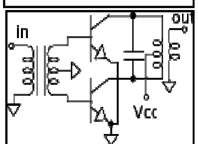
Frequency Multiplication:

While modern frequency synthesizers can output a clean stable signal up through UHF, for many years, especially at higher frequencies, it was not practical to operate the oscillator at the final output frequency. For better frequency stability, it was common to multiply the frequency of the oscillator up to the final, required frequency. This was accommodated by allocating the short wave amateur and marine bands in harmonically related frequencies such as 3.5, 7, 14 and 28 MHz. Thus one crystal or VFO could cover several bands. In simple equipment this approach is still used occasionally.



A push-push frequency doubler. The output is tuned to two times the input frequency.

If the output of an amplifier stage is simply tuned to a multiple of the frequency with which the stage is driven, the stage will give a large harmonic output. Many transmitters have used this simple approach successfully. However these more complex circuits will do a better job. In a push-push stage, the output will only contain *even* harmonics. This is because the currents which would generate the fundamental and the odd harmonics in this circuit are cancelled by the second device. In a push-pull stage, the output will contain only *odd* harmonics because of the cancelling effect.



A push- pull frequency tripler. The output is tuned to three times the

CW Activity:

I listened in on the CW WW contest over the weekend of the 12th and wow was it busy. I must say though, there were many stations I could not copy at all, not because the band was bad or sigs were bad, but they were just so damn fast.

It still amazes me that people have been able to get their brains to such a stage where they can understand exactly what's coming out there. To the guys who partake in these events, I stand in awe of your abilities.

Right across the entire CW spectrum there were stations calling for the contest (that's one that even I can hear). Although I could not get the call signs, I was able to hear the "dah dit ditditdit dah". It just impressed upon me even more that CW is far from dead. It is an international language that works no difference what language you speak.

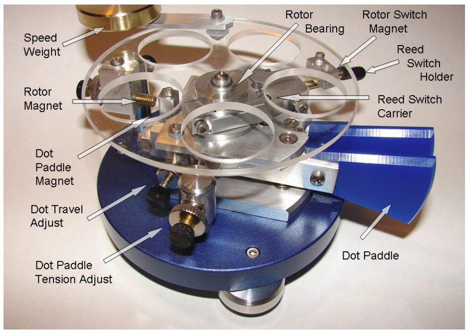
I have to admit that even here in sunny SA, CW is far from dead too. There is a small group of enthusiasts who are keeping it alive, either on the DX bands, or locally. But it certainly is still alive and well in SA.

Someone commented on the SARL forum a short while ago, that SA hams were actually quite sought after in the DX fraternity on CW, because there are not so many of them around.

To me, that sounds quite exciting and I can see why it is that some of the guys prefer working DX. There is just so much happening there, that it may be worthwhile, especially if you are chasing a DXCC award, to get a good few more countries and zones into your log book.

So if you have been having any second thoughts about getting oyur old rusty key out and getting back in to the swing of things with some CW, then now might be the perfect time to do it.

There is lots of room for practice and never a problem the band is going to be crowded.



Rotobug

SSB activity:

It seems we are at that time of the year again where one never knows what band conditions are going to be like. One week they are super, then the next you can hardly hear the local stations.

The 20m relay has proved to be quite successful over this period for the Western Cape stations to join in on the Saturday morning SSB net. Unfortunately, while I am away on leave this will not be available, unless there is someone else who is willing to give it a bash. So from Saturday 26th July to 09 August, there will be no relay on 20m.

For the rest of the country there never seems to really be a problem with hearing any of the stations.

We want to encourage as many of you as possible to join in on the Saturday morning net on 7140 from 08:30. Do try to come up using your valve rigs, but don't think that because you don't have one operational, you can't join in the net.

We know there are many who just listen to the net while keeping themselves busy in the shack. If you are one of these, do come up at the end of the net just to let us know you have been listening. It makes it really worth our while to get the call signs on the log and at least gives us a better idea of who is out there.

The topics of discussion have certainly been a draw card for the net, but we also remind people not to take too long in getting their point across. When there is a net of 20 or more, it takes a while to get to the end of the list and we would much rather give you a 2nd turn than some don't get a first because they get too frustrated.

Trio TS510 Transceiver

AM:

Typical winter conditions apply with the Saturday morning net now as the band only opens after 06:00 in the morning and then of course everyone wants to run off at 07:30 to get some breakfast and coffee before the 08:30 SSB net. So time is short lived.

On the Wednesday evening net, there are times when the band is excellent, but also times when it fades terribly at about 19:30. So the best thing is to get in to your shacks and try to see if there is anyone out there.

These past few weeks it has been terribly cold in my shack as it is outside, away from the house. On some mornings, the little bar heater I have in there was not enough to change the temperature by much. When it was –3 deg, I couldn't get it up to more than a measly 0, so I gave up on that one.

Even our fishpond had 15mm of ice on it.

Be that as it may, the AM nets still purr along quite nicely with a good few stations still keeping things going. Of course things get a bit difficult every now and then, but as I was told the other day, Amateur Radio is not for sissies.

I do believe that it is because of the efforts of the few, that the bands are kept alive and inevitably word gets out when activity starts to increase and the bands improve.

So if you aren't one of the few, then keep your ear to the ground and listen for the rumblings of the sound of MF's being played on the 80m band and then come and join us.

You are always welcome.

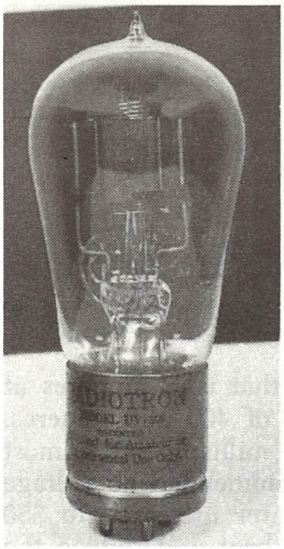
Heathkit DX40

THE FIRST TUBES DESIGNED FOR THE RADIO AMATEUR
by Richard ZS6TF AWA Historian

There was an explosion of amateur voice and music transmissions in 1922. One of the enabling technologies was the advent of oscillator tubes which could operate at radio frequencies and deliver useful power output. Power tubes were announced by RCA early in March 1921 for amateur and commercial use and were listed in the RCA catalogue of September 1, 1921. At the time of the announcement only the UV202 was available, but the press release stated that the UV203 would be available later in March, and the UV204 would be on sale sometime in April 1921.

The UV202 was similar in construction to the earlier UV201 receiving valve but larger; about 2 1/2 inches in diameter and 5 inches high. It was rated at 5 watts output, a conservative rating, and had a tungsten filament which took 2.35 amperes at 7.5 volts. They were marked ' Licensed for Amateur or Experimental Use Only'.

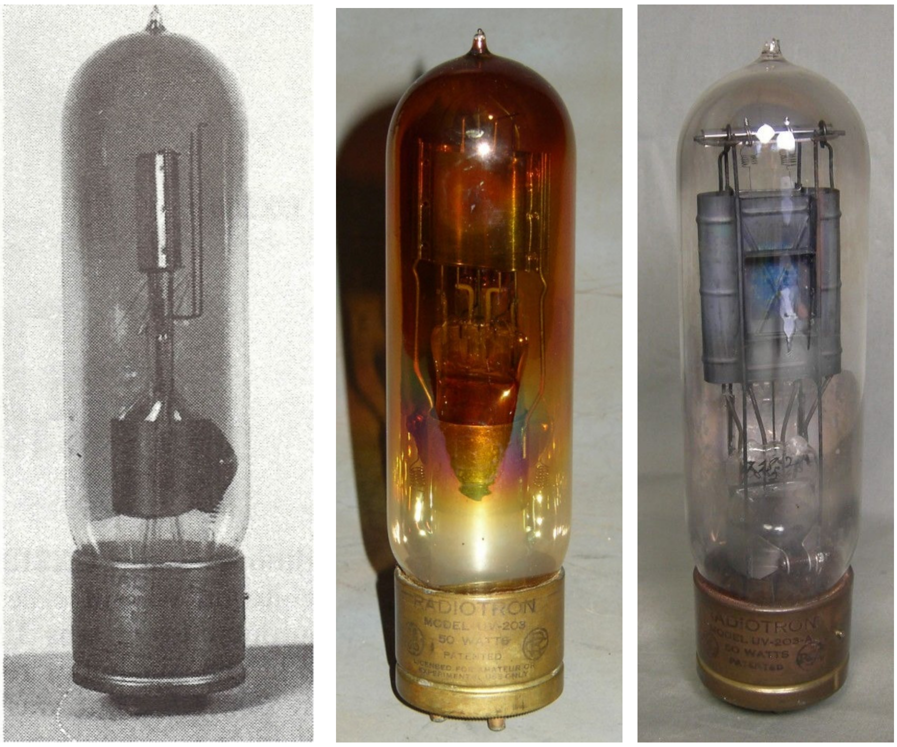
In this era when batteries were the norm, high DC voltages were difficult for the amateur to obtain. The normal anode voltage was 350 volts and the anode current 45 milliamperes. It had an amplification factor of 8, and an output impedance of 4000 ohms. This tube was beloved by the amateurs, who built transmitters with multiple UV202s operating in parallel permitted by the close tolerances maintained by the manufacturer GE. An article in a QST from 1924 depicted 6 of them mounted in a circle. These were primitive low frequency tubes and It was not unusual for home brewers to remove the base and wire the tube directly into the oscillator circuit to minimize capacity.



Radiotron UV202 tube.

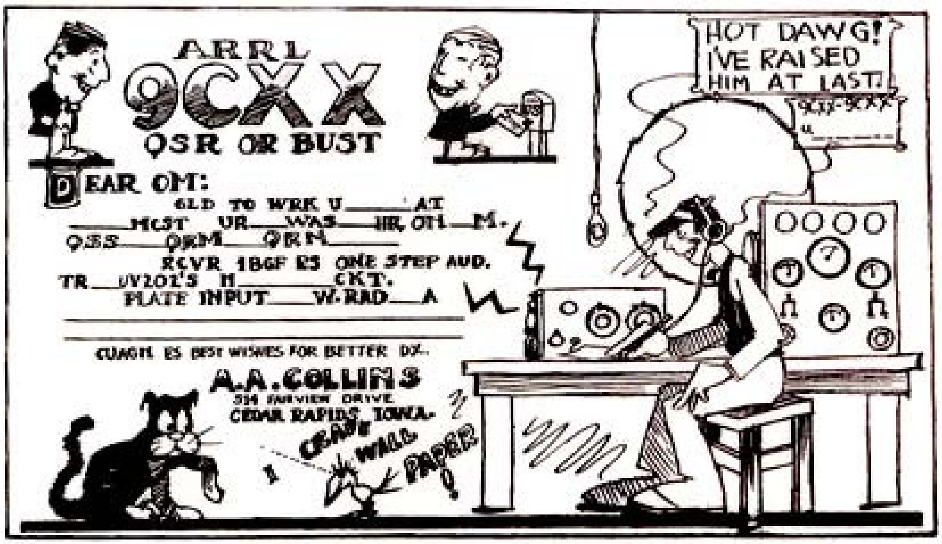
The UV202 could also be purchased as the Cunningham C302, same tube, just badge engineered, even then. The UV prefix indicated that the tube had short pins and required a bayonet socket. A UX prefix indicated that the pins were long and could be plugged into a flat socket. When the first tetrode tubes were made, they had 5 pins and were marked with a UY.
The UV202 was discontinued in 1925. It was replaced in the amateur field by the UV210, and later by the UX210, the latter having been announced on September 1, 1925.

The UV203, the "50 watter," announced in March 1921, was advertised in April and appeared in the RCA catalogue of September 1 1921. It had a cylindrical bulb approximately 2 inches in diameter and an overall height of 7 1/2 inches. The filament was of tungsten, operating with 6.5 amperes at 10 volts. The normal anode voltage was 1000 volts, and the anode current was 150 milliamperes. The amplification factor was about 15. It was claimed that "several" of these tubes could be operated in parallel because of their uniformity.



Radiotron UV203 tube.

Manufacture of the UV203 was discontinued in 1926, and it was replaced by the UV203A.



UV202'S were good enough for Art Collins in the days of his youth (hamgallery.com)

SUNSPOTS

After some discussion around sunspots on the last SSB net, I decided to get some information around this phenomenon. I thought there may just be some people out there, like me, who don't quite have a full grasp on this subject. (Ed)

Sunspots are temporary phenomena on the photosphere of the Sun that appear visibly as dark spots compared to surrounding regions. They are caused by intense magnetic activity, which inhibits convection by an effect comparable to the eddy current brake, forming areas of reduced surface temperature. They usually appear as pairs, with each sunspot having the opposite magnetic pole to the other.

Although they are at temperatures of roughly 3,000–4,500 K (2,700–4,200 °C), the contrast with the surrounding material at about 5,780 K (5,500 °C) leaves them clearly visible as dark spots, as the luminous intensity of a heated black body (closely approximated by the photosphere) is a function of temperature to the fourth power. If the sunspot were isolated from the surrounding photosphere it would be brighter than the Moon. Sunspots expand and contract as they move across the surface of the Sun and can be as small as 16 kilometers (10 mi) and as large as 160,000 kilometers (100,000 mi) in diameter, making the larger ones visible from Earth without the aid of a telescope. They may also travel at relative speeds ("proper motions") of a few hundred meters per second when they first emerge onto the solar photosphere.
Manifesting intense magnetic activity, sunspots host secondary phenomena such as coronal loops (prominences) and reconnection events. Most solar flares and coronal mass ejections originate in magnetically active regions around visible sunspot groupings. Similar phenomena indirectly observed on stars are commonly called starspots and both light and dark spots have been measured.

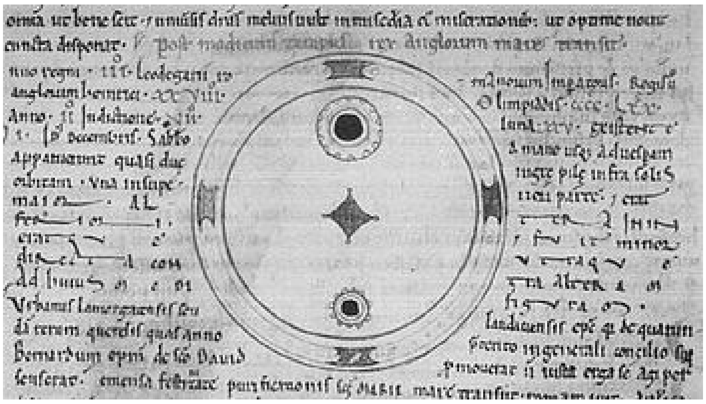
History

Prehistoric evidence

Studies of stratigraphic data have suggested that the solar cycles have been active for hundreds of millions of years, if not longer; measuring varves in precambrian sedimentary rock has revealed repeating peaks in layer thickness, with a pattern repeating approximately every eleven years. It is possible that the early atmosphere on Earth was more sensitive to changes in solar radiation than today, so that greater glacial melting (and thicker sediment deposits) could have occurred during years with greater sunspot activity. This would presume annual layering; however, alternate explanations (diurnal) have also been proposed.
Analysis of tree rings has revealed a detailed picture of past solar cycles: Dendrochronologically dated radiocarbon concentrations have allowed for a reconstruction of sunspot activity dating back 11,400 years, far beyond the four centuries of available, reliable records from direct solar observation.

Early observations

A drawing of a sunspot in the Chronicles of John of Worcester.

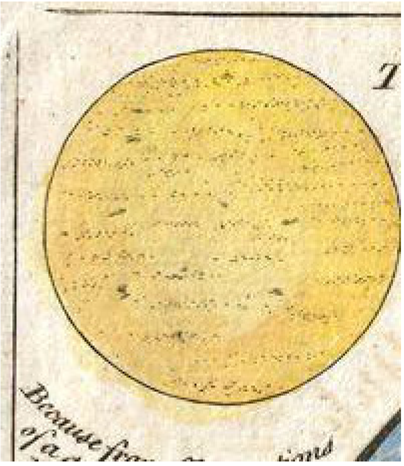


The earliest surviving record of sunspot observation dates from 364 BC, based on comments by Chinese astronomer Gan De in a star catalogue. By 28 BC, Chinese astronomers were regularly recording sunspot observations in official imperial records.
The first clear mention of a sunspot in Western literature, around 300 BC, was by the ancient Greek scholar Theophrastus, student of Plato and Aristotle and successor to the latter. A more recent sunspot observation was made on 17 March 807 AD by the Benedictine monk Adelmus, who observed a large sunspot that was visible for eight days; however, Adelmus incorrectly concluded he was observing a transit of Mercury. A large sunspot was also seen at the time of Charlemagne's death in 813 AD. Sunspot activity in 1129 was described by John of Worcester, and Averroes provided a description of sunspots later in the 12th century; however, these observations were also misinterpreted as planetary transits, until Galileo gave the correct explanation in 1612.

17th and 18th centuries

Sunspots were first observed telescopically in late 1610 by the English astronomer Thomas Harriot and Frisian astronomers Johannes and David Fabricius, who published a description in June 1611. At the latter time, Galileo had been showing sunspots to astronomers in Rome, and Christoph Scheiner had probably been observing the spots for two or three months using an improved helioscope of his own design. The ensuing priority dispute between Galileo and Scheiner, neither of whom knew of the Fabricius' work, was thus as pointless as it was bitter.
Sunspots had some importance in the debate over the nature of the Solar System. They showed that the Sun rotated, and their

Sunspots in 1794 Samuel Dunn Map



comings and goings showed that the Sun changed, contrary to Aristotle (who taught that all celestial bodies were perfect, unchanging spheres).

Rudolf Wolf studied the historical record in an attempt to establish a database on past cyclic variations. His database extended only to 1700, although the technology and techniques for careful solar observations were first available in 1610. Gustav Spörer later suggested a 70-year period before 1716 in which sunspots were rarely observed as the reason for Wolf's inability to extend the cycles into the 17th century.

Sunspots were rarely recorded during the second part of 17th century. Later analysis revealed the problem not to be a lack of observational data but included references to negative observations. Building upon Spörer's earlier work, Edward Maunder suggested that the Sun had changed from a period in which sunspots all but disappeared from the solar surface to a renewal of sunspot cycles starting in about 1700. Adding to this understanding of the absence of solar cycles were observations of aurorae, which were absent at the same time. Even the lack of a solar corona during solar eclipses was noted prior to 1715. The period of low sunspot activity from 1645 to 1717 is known as the "Maunder Minimum".

19th century

The cyclic variation of the number of sunspots was first observed by Heinrich Schwabe between 1826 and 1843 and led Wolf to make systematic observations starting in 1848. The Wolf number is a measure of individual spots and spot groupings, which correlates to a number of solar observables. Also in 1848, Joseph Henry projected an image of the Sun onto a screen and determined that sunspots were cooler than the surrounding surface.

After the resumption of sunspot activity, Heinrich Schwabe in 1844 in *Astronomische Nachrichten* (Astronomical News) reported a periodic change in the number of sunspots.

The Sun emitted an extremely powerful flare on its visible hemisphere on 1 September 1859, leading to what is known as the Carrington Event. It interrupted electrical telegraph service and caused visible aurorae as far south as Havana, Hawaii, and Rome with similar activity in the southern hemisphere.

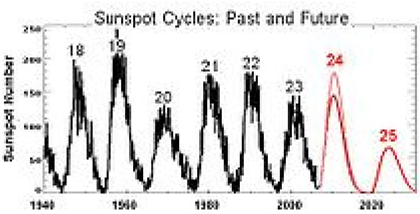
20th century

The American solar astronomer George Ellery Hale, as an undergraduate at MIT, invented the spectroheliograph, with which he made the discovery of solar vortices. In 1908, Hale used a modified spectroheliograph to show that the spectra of hydrogen exhibited the Zeeman effect whenever the area of view passed over a sunspot on the solar disc. This was the first indication that sunspots were basically magnetic phenomena, which appeared in pairs that corresponded with two magnetic poles of opposite polarity. Subsequent work by Hale demonstrated a strong tendency for east-west alignment of magnetic polarities in sunspots, with mirror symmetry across the solar equator; and that the magnetic polarity for sunspots in each hemisphere switched orientation, from one sunspot cycle to the next. This systematic property of sunspot magnetic fields is now commonly referred to as the "Hale–Nicholson law", or in many cases simply "Hale's law".

21st century

The most powerful flare observed by satellite instrumentation began on 4 November 2003 at 19:29 UTC, and saturated instruments for 11 minutes. Region 486 has been estimated to have produced an X-ray flux of X28. Holographic and visual observations indicate significant activity continued on the far side of the Sun.

Measurements made in the latter part of the 2000s (decade) and based also on observation of infrared spectral lines, have suggested that sunspot activity may again be disappearing, possibly leading to a new minimum. From 2007 to 2009, sunspot levels were far below average. In 2008, the Sun was spot-free 73 percent of the time, extreme even for a solar minimum. Only 1913 was more pronounced, with 85 percent of that year clear. The Sun continued to languish through mid-December 2009, when the largest group of sunspots to emerge for several years appeared. Even then, sunspot levels remained well below normal.

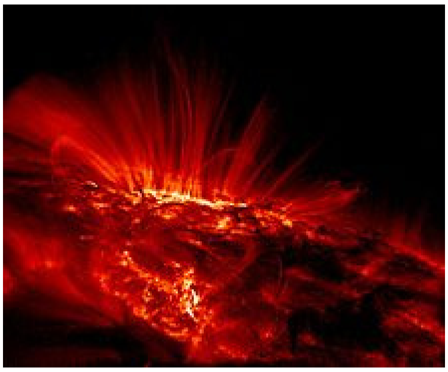


Nasa's 2006 prediction. At 2010/2011, the sunspot count was expected to be at its maximum, but in reality in 2010 it was still at its minimum.

In 2006, NASA made a prediction for the next sunspot maximum, being between 150 and 200 around the year 2011 (30–50% stronger than cycle 23), followed by a weak maximum at around 2022. The prediction did not come true. Instead, the sunspot cycle in 2010 was still at its minimum, where it should have been near its maximum, which shows the Sun's current unusual low activity.
Due to a missing jet stream, fading spots, and slower activity near the poles, independent scientists of the National Solar Observatory (NSO) and the Air Force Research Laboratory (AFRL) predicted in 2011 that the next 11-year solar sunspot cycle, Cycle 25, would be greatly reduced or might not happen at all.

Cycle 24 is now well underway (as of March 2013). Measurements indicate that the minimum occurred around December 2008 and the next maximum was predicted to reach a sunspot number of 90 around May 2013. The monthly sunspot number was still rising as of March 2014.

Physics



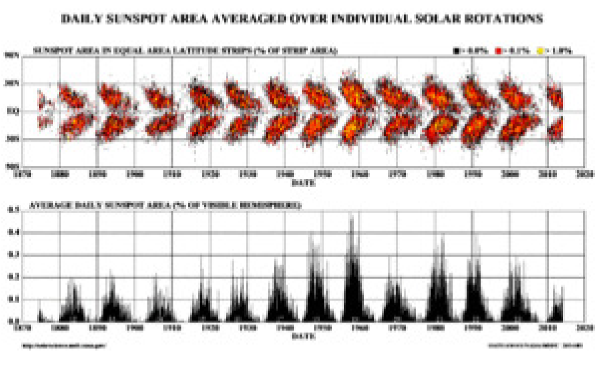
A sunspot viewed close-up in ultraviolet light, taken by the TRACE spacecraft.

Although the details of sunspot generation are still a matter of research, it appears that sunspots are the visible counterparts of magnetic flux tubes in the Sun's convective zone that get "wound up" by differential rotation. If the stress on the tubes reaches a certain limit, they curl up like a rubber band and puncture the Sun's surface. Convection is inhibited at the puncture points; the energy flux from the Sun's interior decreases; and with it surface temperature.

The Wilson effect tells us that sunspots are actually depressions on the Sun's surface. Observations using the Zeeman effect show that prototypical sunspots come in pairs with opposite magnetic polarity. From cycle to cycle, the polarities of leading and trailing (with respect to the solar rotation) sunspots change from north/south to south/north and back. Sunspots usually appear in groups.

The sunspot itself can be divided into two parts:
The central umbra, which is the darkest part, where the magnetic field is approximately vertical (normal to the Sun's surface).
The surrounding penumbra, which is lighter, where the magnetic field is more inclined.

Magnetic pressure should tend to remove field concentrations, causing the sunspots to disperse, but sunspot lifetimes are measured in days or even weeks. In 2001, observations from the Solar and Heliospheric Observatory (SOHO) using sound waves traveling below the Sun's photosphere (local helioseismology) were used to develop a three-dimensional image of the internal structure below sunspots; these observations show that there is a powerful downdraft underneath each sunspot, forming a rotating vortex that concentrates the magnetic field. Sunspots can thus be thought of as self-perpetuating storms, analogous in some ways to terrestrial hurricanes.



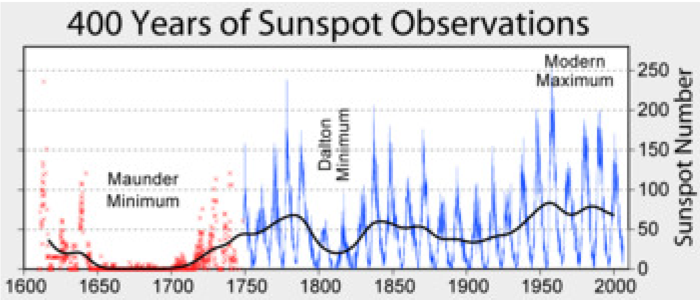
Butterfly diagram showing paired Spörer's law behavior

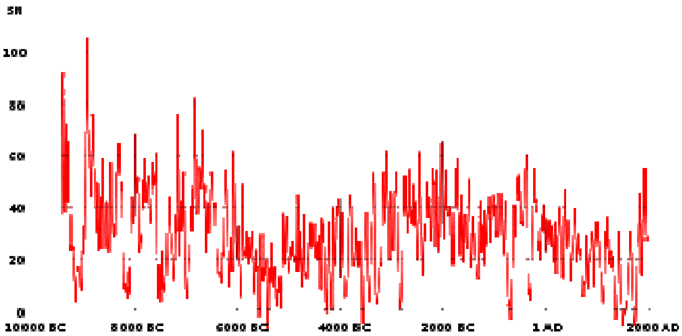
Sunspot activity cycles about every eleven years. The point of highest sunspot activity during this cycle is known as Solar Maximum, and the point of lowest activity is Solar Minimum. Early in the cycle, sunspots appear in the higher latitudes and then move towards the equator as the cycle approaches maximum: this is called Spörer's law.

Wolf number sunspot index displays various periods, the most prominent of which is at about 11 years in the mean. This period is also observed in most other expressions of solar activity and is deeply linked to a variation in the solar magnetic field that changes polarity with this period, too.

The modern understanding of sunspots starts with George Ellery Hale, who first linked magnetic fields and sunspots in 1908. Hale suggested that the sunspot cycle period is 22 years, covering two polar reversals of the solar magnetic dipole field. Horace W. Babcock later proposed a qualitative model for the dynamics of the solar outer layers. The Babcock Model explains that magnetic fields cause the behavior described by Spörer's law, as well as other effects, which are twisted by the Sun's rotation.

Variation





11,000 year sunspot reconstruction

Sunspot populations quickly rise and more slowly fall on an irregular cycle of 11 years, although significant variations in the number of sunspots attending the 11-year period are known over longer spans of time. For example, from 1900 to the 1960s, the solar maxima trend of sunspot count has been upward; from the 1960s to the present, it has diminished somewhat. Over the last decades the Sun has had a markedly high average level of sunspot activity; it was last similarly active over 8,000 years ago.

The number of sunspots correlates with the intensity of solar radiation over the period since 1979, when satellite measurements of absolute radiative flux became available. Since sunspots are darker than the surrounding photosphere it might be expected that more sunspots would lead to less solar radiation and a decreased solar constant. However, the surrounding margins of sunspots are brighter than the average, and so are hotter; overall, more sunspots increase the Sun's solar constant or brightness. The variation caused by the sunspot cycle to solar output is relatively small, on the order of 0.1% of the solar constant (a peak-to-trough range of 1.3 $W \cdot m^{-2}$ compared to 1366 $W \cdot m^{-2}$ for the average solar constant). Sunspots were rarely observed during the Maunder Minimum in the second part of the 17th century (approximately from 1645 to 1715).

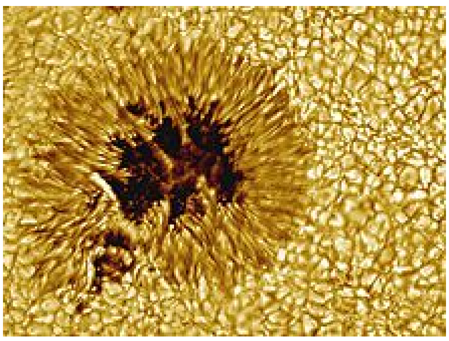
The 11-year solar cycles are numbered sequentially, starting with the observations made in the 1750s.

Observation

The Swedish 1-m Solar Telescope at Roque de los Muchachos Observatory

Sunspots are observed with land-based and Earth-orbiting solar telescopes. These telescopes use filtration and projection techniques for direct observation, in addition to various types of filtered cameras. Specialized tools such as spectroscopes and spectrohelioscopes are used to examine sunspots and sunspot areas. Artificial eclipses allow viewing of the circumference of the Sun as sunspots rotate through the horizon.

Since looking directly at the Sun with the naked eye permanently damages vision, amateur observation of sunspots is generally conducted indirectly using projected images, or directly through protective filters. Small sections of very dark filter glass, such as a #14 welder's glass are effective. A telescope eyepiece can project the image, without filtration, onto a white screen where it can be viewed indirectly, and even traced, to follow sunspot evolution. Special purpose hydrogen-alpha narrow bandpass filters as well as aluminum coated glass attenuation filters (which have the appearance of mirrors due to their extremely high optical density on the front of a telescope provide safe observation through the eyepiece.



Application

Detail of a sunspot in 2005. The granulation of the Sun's surface can be seen clearly
Due to its link to other kinds of solar activity, sunspot occurrence can be used to help predict space weather, the state of the ionosphere, and hence the conditions of short-wave radio propagation or satellite communications. Solar activity (and the sunspot cycle) are frequently discussed in the context of global warming; Jack Eddy noted the apparent correlation between the Maunder Minimum of sunspot occurrence and the Little Ice Age in European climate. Sunspots themselves, in terms of the magnitude of their radiant-energy deficit, have only a weak effect on the terrestrial climate in a direct sense. On longer time scales, such as the solar cycle, other magnetic phenomena (faculae and the chromospheric network) do correlate with sunspot occurrence. It is these other features that make the solar constant increase slightly at sunspot maxi-

ma, when naively one might expect that sunspots would make it decrease.

British economist William Stanley Jevons suggested in the 1870s that there is a relationship between sunspots and business cycle crises. Jevons reasoned that sunspots affect Earth's weather, which, in turn, influences crops and, therefore, the economy.

Spots on other stars

In 1947, G. E. Kron proposed that starspots were the reason for periodic changes in brightness on red dwarfs. Since the mid-1990s, starspot observations have been made using increasingly powerful techniques yielding more and more detail: photometry showed starspot growth and decay and showed cyclic behavior similar to the Sun's; spectroscopy examined the structure of starspot regions by analyzing variations in spectral line splitting due to the Zeeman Effect; Doppler imaging showed differential rotation of spots for several stars and distributions different from the Sun's; spectral line analysis measured the temperature range of spots and the stellar surfaces. For example, in 1999, Strassmeier reported the largest cool starspot ever seen rotating the giant K0 star XX Triangulum (HD 12545) with a temperature of 3,500 K (3,230 °C), together with a warm spot of 4,800 K (4,530 °C).

Radio communication

Skywave modes of radio communication operate by bending (refracting) radio waves (electromagnetic radiation) through the Ionosphere. During the "peaks" of the solar cycle, the ionosphere becomes increasingly ionized by solar photons and cosmic rays. This affects the path (propagation) of the radio wave in complex ways which can either facilitate or hinder local and long distance communications. Forecasting of skywave modes is of considerable interest to commercial marine and aircraft communications, amateur radio operators, and shortwave broadcasters. These users utilize frequencies within the High Frequency or 'HF' radio spectrum which are most affected by these solar and ionospheric variances. Changes in solar output affect the maximum usable frequency, a limit on the highest frequency usable for communications.

As a result of skywave propagation, a signal from a distant AM broadcasting station, a shortwave station, or—during sporadic E propagation conditions (principally during the summer months in both hemispheres)—a low frequency television station can sometimes be received as clearly as local stations. Skywave propagation is distinct from groundwave propagation, where radio waves travel near Earth's surface without being reflected or refracted by the atmosphere—the dominant propagation mode at lower frequencies, and line-of-sight propagation, in which radio waves travel in a straight line, the dominant mode at higher frequencies. Most long-distance shortwave (high frequency) radio communication—between 3 and 30 MHz—is a result of skywave propagation. Since the early 1920s amateur radio operators (or "hams"), limited to lower transmitter power than broadcast stations, have taken advantage of skywave for long distance (or "DX") communication.

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Antique Wireless Association of Southern Africa

Mission Statement

Our aim is to facilitate, generate and maintain an interest in the location, acquisition, repair and use of yesterdays radio's and associated equipment. To encourage all like minded amateurs to do the same thus ensuring the maintenance and preservation of our amateur heritage.

Membership of this group is free and by association.

Notices:

Net Times and Frequencies:

Saturday 06:00—AM Net—3615
Saturday 07:15—Western Cape SSB Net— 3630
Saturday 08:30— National SSB Net— 7140; relayed on 14140
Saturday 14:00— CW Net—7020
Wednesday 19:00— AM Net—3615, band conditions permitting.

AWA Website is operational;

Visit the website at : **http://awasa.org.za/** and register on the site.

WANTED:

Circuit diagram for HIOKI model AS-1000 analogue multimeter needed for restoration project.
James ZS5ABW tel 033-3867862 072-1799906