Colour coding and new vexillological avenues for flag design

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Abstract
Flag designers will often design 'good flags' to supplant 'bad flags'.'[1] *These attempts are usually futile endeavours. The primary resistance to the acceptance of new 'good flag' design is the challenge of supplanting the established flag.*[2] *This paper proposes another more fruitful route open for vexillologists desirous of creating new 'good flags'.*[3] *Rather than attempt to unseat an officially recognised flag, this paper will encourage vexillologists to expend their creative flag efforts on non-flagged areas and concepts. It may seem that every inch of the Earth is already flagged, but upon closer scrutiny this paper will show that there is a plethora of areas, ideas, and collective concepts that are ripe for 'Proper Flag Colonisation'. 'Proper Flag Colonisation' refers to the fact that no other flag has yet been issued to a particular geographic area, concept, or collective association. Subsequently being the first vexillologist to create a flag for a particular concept or area puts one front and centre, and creates an organic gravitas of leadership since being first is important in any scholastic endeavour.*

Introduction: colour coding system explained
The newest element and original aspect of this paper proposes a universal colour-coded flag metric such that each digit in the standard numeral system, zero to nine, is assigned a specific colour. Secondly this paper will point out other areas and concepts that do not have a flag. Furthermore the colour-coded metric will be demonstrated with several examples. In essence the adoption of a universal colour metric has countless applications for flags, especially with geographic areas associated with numbers.

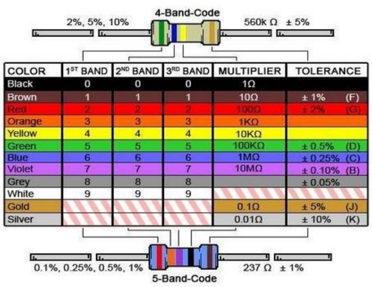
Colour coding is a popular tool already used in businesses, schools, and government. Perhaps the most pervasive colour-coded system is the simple traffic light: red, yellow, and green that indicate stop, caution/slow, and go. It may be the only universal system of symbolic communication agreed upon by all modern cultures.

On the other hand, a colour-to-number system that assigns a specific colour to each of the ten numerical digits has yet to make noticeable headway into the

1 'Good Flag' and 'Bad Flag' refers to Ted Kaye's book on how to design a proper flag. Ted Kaye, *Good Flag, Bad Flag* (North American Vexillological Association, 2006).
2 Based upon general consensus of vexillological colleagues about replacing ineffective flags with simple vexillological preferences.
3 Reinforcing Kaye's second point, that flag creators should '2. Use Meaningful Symbolism'.

general public sphere.[4] Yet in the field of electrical engineering a universal colour-coded numerical system is in common use.[5]

The electrical engineering colour code deals with the electrical component of resistors. Resistors are colour coded with stripes according to the resistance value, whose scientific unit is the ohm.[6] It is an elegant system of a universal number-to-colour association.



COLOR	1ST BAND	2ND BAND	3RD BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	± 0.5% (D)
Blue	6	6	6	1MΩ	± 0.25% (C)
Violet	7	7	7	10MΩ	± 0.10% (B)
Grey	8	8	8		± 0.05%
White	9	9	9		
Gold				0.1Ω	± 5% (J)
Silver				0.01Ω	± 10% (K)

The colour code as used on resistors. https://www.digikey.co.uk/en/resources/conversion-calculators/ conversion-calculator-resistor-color-code#modal

The fundamentals of this system are easy to grasp. But the complexity increases with the position of a coloured stripe, which can change its value and meaning. Beyond a basic ten colour-to-digit value, colours also code for various percentages or powers of ten, as to indicate the tolerance range of an electrical component.[7]

Certainly one can apply this scientifically sound model of colour coding to flags, but with several modifications. So if one professional field has adopted a universal number-colour coding system, it is possible for another field to enjoy such a system.

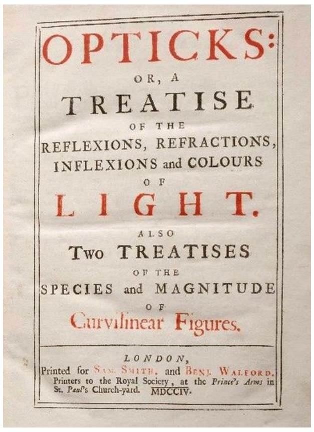
Assigning a colour to a specific numerical digit (0-9) is essentially an arbitrary process, but it would make sense to follow a colour pattern that is known to all cultures. One such ubiquitous pattern is the rainbow. The rainbow is appropriate because it presents colours in an organic, ordered array. But which end should we start from; the top, the bottom, or somewhere in the middle? As a general rule of thumb most cultures read in a pattern from top to bottom. Reading from left-to-right or right-to-left depends on one's culture, as Hebrew and Arabic are read from right-to-left, as are Chinese and Japanese when written vertically.[8] But regardless of which direction a script is read, the majority of writing follows a top to bottom procession. One obscure language that was read from the bottom to the top was Ancient Berber.[9]

Although a popular flag-to-number system is in use, the International Maritime, it is cumbersome. In addition several colours are not represented: orange,

4 Stephen R. Matt, *Electricity and Basic Electronics*, 8th ed. (Goodheart-Willcox, 2009), p. 69.
5 Ian Sinclair, *Electronics Simplified* (Oxford: Elsevier, 2011), p. 333.
6 Matt, *Electricity*, p. 62.
7 Ibid. p. 70.
8 http://www.omniglot.com/writing/direction.htm#rtlvbt is a comprehensive website covering the various scripts.
9 Ibid. No modern language reads down-up as a standard convention, aside from novelty.

green, purple, and pink. Furthermore some of the flags already look like national flags: Michael-Scotland, Tango-France (reversed), X-ray-Finland, 1-Japan, 4-Denmark, and 8-England. On top of that, the flags even confound themselves: Oscar-7, Papa-2, Tango-3, and Uniform-8. Having already attempted to use these flags for the following paper, the results were poor and clarity was not possible due to the confusing and redundant nature of the flags listed above. Rather, letting a specific colour speak for a specific number as within the electrical engineering field demonstrated clarity.

Following the dominant top-to-bottom procession, the colours of the rainbow provide a natural numerical order.[10] The rainbow itself is a spectrum of nearly infinite colours. Perhaps the simplest reduction one can make is to follow the seven basic colours as defined by Isaac Newton in his seminal work *Opticks,* published in 1704. It is from Newton's generalisation of seven colours: red, orange, yellow, green, blue, indigo, and violet; that the numbers one, two, three, four, five, six, and seven are apparent.[11]



OPTICKS:
OR, A
TREATISE
OF THE
REFLEXIONS, REFRACTIONS, INFLEXIONS and COLOURS
OF
LIGHT.
ALSO
Two TREATISES
OF THE
SPECIES and MAGNITUDE
OF
Curvilinear Figures.

LONDON,
Printed for SAM. SMITH, and BENJ. WALFORD, Printers to the Royal Society, at the Prince's Arms in St. Paul's Church-yard. MDCCIV.

Left, Newton's prism experiment.
http://thescientificodyssey.typepad.com/my-blog/2017/01/episode-3271-supplemental-isaac-newton-the-miracle-years.html
Right, Isaac Newton, Opticks*, title page.*
http://www.rarebookroom.org/Control/nwtopt/index.html

For the numbers eight, nine, and zero, three other colours are arbitrarily chosen with some connective reasoning. Since white light was discovered to contain all the colours, this counterintuitive property of 'white light' makes it a good fit for the number zero, whose mathematical 'zeroness' property was also overlooked for centuries by the West.[12] The next appropriate colour to select is black, which has been assigned to the number eight. As the modern number eight is essentially the infinity symbol at 90 degrees, the dark black sky of night is the

10 Note, however, that in a double rainbow the colour sequence of the second rainbow is reversed. For more information, see http://www.atoptics.co.uk/rainbows/twin1.htm.

11 Isaac Newton, *Opticks: Or, A Treatise of the Reflexions, Refractions, Inflexions and Colours of Light. Also Two Treatises of the Species and Magnitude of Curvilinear Figures* (London: Royal Society, 1704), http://www.rarebookroom.org/Control/nwtopt/index.html, p.34.

12 Arielle Eckstut and Joann Eckstut, *The Secret Language of Color* (New York: Black Dog and Levental), p. 12.

natural view of the infinite edges of the visible universe. Finally comes the number nine, which has the colour pink as its assigned colour. The rationale for pink is due to its association with the feminine.

Blue is a peculiar colour that has some debatable interpretation. It seems that Newton's definition of blue was akin to the modern colour of cyan.[13] Likewise indigo from Newton's interpretation is by today's definition a modern or common blue.[14] Furthermore indigo currently has various interpretations depending on the observer from navy blue to a purplish blue.

Full colour metric with colours added by the author

In order to avoid the confusion with two colours ascribed a blue character: blue and indigo, in this paper Newton's first blue will be referred to as cyan as the colour between green and blue. The darker blue which Newton called indigo will simply be called blue in the paper.

Part A: Latitude and longitude

A1: Simple latitude and longitude

The first set of flags to demonstrate the colour metric concerns latitude and longitude.

These first set of latitude and longitude flags indicate an area in degrees such that the latitude and longitude values for minutes and seconds are not included. As this is the first application, a simple model is appropriate. Secondly it creates a nicely sized swathe of area that can connect a community.

The approximate area of one degree of latitude and longitude is slightly larger than the US state of Rhode Island.[15] These basic latitude and longitude flags convey two pieces of information: first the background pattern uses a tribar architecture that represents the longitude, while the centrally placed star conveys latitude.

For example, Ho Chi Minh City (formerly Saigon) sits at 106 degrees east and 10 degrees north.[16] As 1 is coded to red, 0 coded to white, and 6 coded to blue, this produces a reversed French Tribar.

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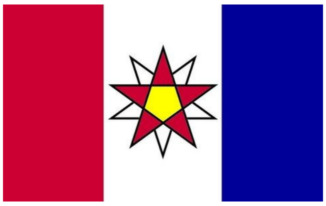
13 Ibid. p. 13.
14 Ibid.
15 http://www.latlong.net/
16 Ibid.



Proposed flag:
Ho Chi Minh City

Since this area is in the Northern Hemisphere, the upwards pointing star is dominant, the downward star is recessive. Otherwise the southern pointing star would be dominant if it were in the Southern Hemisphere. The dominant star is coded red for the digit 1 within 10 degrees, while the recessive star is white for 0 within 10 degrees. Thus the 10's value for latitude is always placed upon the dominant star, while the 1's value is always placed on the recessive star.

The central area of the star is yellow to indicate it is in the Eastern Hemisphere. If this city were in the Western Hemisphere the central area would be white.

Proposed flag: Queen's Tower,
Imperial College, London

However for areas with longitudes from 10 to 99 degrees, there are only two numerical values. Thus one can separate the digits to the ends of the tribar design. Consequently the middle bar (with the latitude star) will always be white. For example, the flag for 99 degrees longitude is a tribar of pink-white-pink. It would initially seem to indicate 909 degrees, but it actually codes for 99 degrees. Doing this makes these flags more distinguishable and gives the central latitude star an extra level of clarity since it will rest on a white bar.

But there is one issue for longitude, in the teens. With this adjustment, the flags for 100 to 109 degrees will look the same for the flags of 10 to 19 degrees. In order to give each flag a unique signature, a vertical white stripe on the coloured bars of the teens provide contrast. The white stripe should be placed nearer the inner white bar, such that the coloured bars will seem to have a total of four stripes: two white stripes and two coloured stripes of equal width. One exception is for 10 degrees, it will only have two stripes since the white bars from the fly and middle will merge into a larger white field.

A2: Complex latitude and longitude

If further resolution is wanted to include minutes and seconds, these coloured principles can be applied but by using a different pattern.

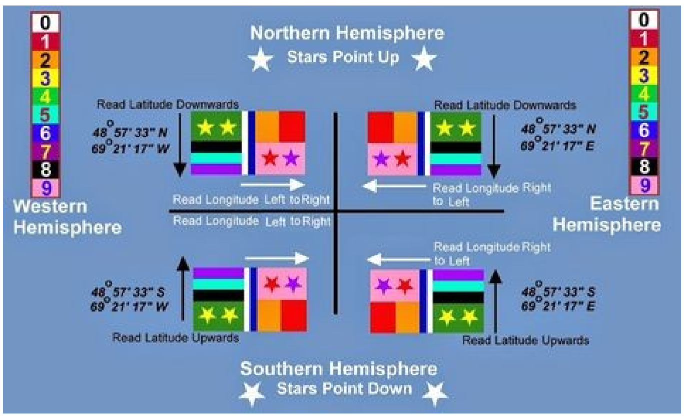
In this case the flag is divided into a longitude half and latitude half. But for these flags, the reading of the flag is based upon different orientations.

Flags for the Western Hemisphere have the latitude on the hoist side, while flags in the Eastern Hemisphere will have their latitude reading on the fly side.

Flags in the Northern Hemisphere will have the latitude read downwards, while flags in the Southern Hemisphere will have their latitude read upwards.

Flags in the Eastern Hemisphere will have their longitudes read from right to left (as in Arabic or Hebrew), while flags in the Western Hemisphere have their longitudes read from left to right (as in English and most other European Languages). Essentially one flag design can be used to represent four different points on Earth by simply rotating or flipping the flag.

An example where four corners of the Earth have the same pattern yet are oriented in different ways is at: 49 degrees north or south and 69 degrees east or west.[17]



Proposed flags: Northern and Southern hemispheres

These flags are objective international flags that convey information, rather than any state or group identity. They are apolitical flags, for use of any person or nation state. Their purpose is to convey geographical information and establish connectivity between different nations.

A3: Unique latitudes and longitudes

There are some special latitudes and longitudes that merit a unique flag design. The foremost line of longitude qualifying for a unique flag design is the Prime Meridian. The colour metric is abandoned; rather a unique pattern and colour scheme is utilised.

The field for the Prime Meridian flag is orange and in the centre is a blue and white checker design. The checker design is based upon the popular black and white checker flag that is waved at automotive racing events. Consequently the

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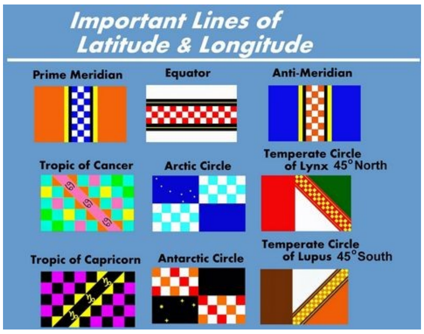
17 Ibid. Mirror coordinates usually have one point in water. Four corners of the globe, however, have matching lat.-long. numbers on dry land – 69 E, 49 S: Southeast: Kerguelen Main Island, France; 69 E, 49 N: Northeast: Barshino, Kazakhstan; 69 W, 49 S: Southwest: Estancia Cerra Negro, Santa Cruz Province, Argentina; 69 W, 49 N: Northwest: Labrieville, Quebec, Canada.

checker design denotes a celebratory tone, since crossing the Prime Meridian is often taken as a celebratory event by persons who live far from this honoured line of longitude. This flag fits loosely into a tribar category. Also the colour palette was chosen so that this flag should not be confused with the flag of any other nation.



Proposed flags: key latitude and longitude (At ICV27, the Prime Meridian flag was hoisted over the Royal Observatory, Greenwich)

Conversely the opposite 180th meridian uses the same pattern but has the orange and blue colours reversed. Furthermore a flag for the International Dateline mixed the colours into another unique design. It has a black and yellow checker pattern with white and orange vertical stripes separating the two fields of orange and blue, with the orange field on the hoist side and the blue on the fly side.

Several unique latitude flags are also warranted. They include the Equator, the Tropic of Cancer, the Tropic of Capricorn, the Arctic Circle and the Antarctic Circle.

Creatively, flags for the 45th north and 45th south are worthy of a flag. They are important in that they represent the middle temperate zone between the Equator and Poles. Likewise 45 degrees is a special angle in mathematics as it indicates the midway angle of the square.

These special lines of latitude were given new names to further enhance their status: the 45th north is named as the Temperate Circle of Lynx while the 45th south is named the Temperate Circle of Lupus. These names are derived from constellations that are parallel to either of the 45ths on the celestial sphere: corresponding from declination-to-latitude.[18] These names utilise an already established latitude nomenclature, borrowing the word circle from the polar circles, and a constellation name as used with the tropic circles.

Finally there is a flag for the most important line of latitude: the Equator. The pattern for the Equator is a horizontal tribar, as most lay maps read latitude with a horizontal orientation. Once again a checker pattern is used to denote a celebratory atmosphere.

Perhaps it is more celebratory to cross the Equator than the Prime Meridian since its nature is more organic as opposed to the arbitrary selection of the

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18 *International Conference, Held at Washington for the Purpose of Fixing a Prime Meridian and a Universal Day. October, 1884. Protocols of the Proceedings* (Gibson Bros, 1884), http://www.gutenberg.org/files/17759/17759-h/17759-h.htm

Prime Meridian? There was little debate on the definition of where the Equator should fall, but the decision to place the Prime Meridian was a lengthy process.

The colours of the central checker pattern is red and white, which symbolises a hot and striking flare, as in expressions red hot or white hot. Since this region of the Earth is dominantly hot all year round, unless one is at a high altitude as is the case with Mt Kenya and the always snow-covered Camberley volcano.[19]

Please note that when this flag was initially designed the colour to number coding system was not yet invented. It is only a coincidence, perhaps a subconscious one at that, that the white bars reflect the number zero. White was chosen because of the blinding white light produced by the sun that directly hits this region of the Earth.

The flags for the Tropic of Cancer and Tropic of Capricorn share similar designs as they are complementary latitudes on opposite hemispheres. A full checker pattern with a diagonal bend was employed. The central bar with the emblems of the zodiac denotes which tropic it represents: three Cancer symbols for the Tropic of Cancer and three Capricorn symbols for the Tropic of Capricorn. The colours for the Tropic of Cancer are reflective of the brightly coloured fish and corals that inhabit the warm waters of the tropics. In contrast the colours for the Tropic of Capricorn are reflective of the bioluminescent animals that inhabit the sea.

With the flags of the Polar Circles,a quartered pattern is used. The checker pattern is conserved, once again to convey a celebratory feeling. The colours for the southern Antarctic Circle are derived from the colours found on Antarctica's most famous biped, the penguin. Penguins are famously black and white, but they often have an orange beak and some species have yellow and red feathers, as does the Emperor Penguin.[20] In the lower quarter is a constellation, Octans, the most southerly constellation in the celestial southern skies. It was named after the octant, the eight-sided star compass, whose angle was at 45 degrees, or one eighth of a full circle.[21] The southern polar star is distinguished by having eight points which is reflective of eight in Octans.

For the northern Arctic Circle, the natural colours of icebergs were chosen. In the quarter is the most northerly constellation of Ursa Minor, the Lesser Bear. The North Star is distinguished by having five points while the others stars of the Lesser Bear have four points.

As for the relatively new 'Temperate Circles of Lupus and Lynx' for the 45th south and 45th north, a side panel by the hoist with a square area makes up the field.[22] Within the square panel is a checker diagonal at 45 degrees. It represents the mathematical middle between the Equator at 0 degrees and the poles at 90 degrees.

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19 Smithsonian Institution, National Museum of Natural History, Global Volcanism Program, https://volcano.si.edu/volcano.cfm?vn=35200620 [accessed 25/6/2017].

20 http://www.nationalgeographic.com/animals/birds/e/emperor-penguin/ http://www.penguinworld.com/types/macaroni.html

21 http://www.ianridpath.com/startales/octans.htm

22 Walter Gater and Anton Vamplew, *The Practical Astronomer* (Dorling Kindersley, 2010).

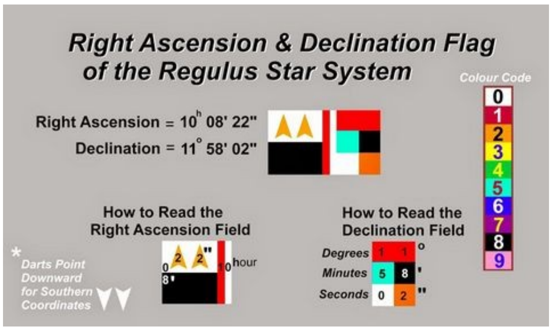
The colours also have meanings. For Lynx, the colours red, yellow, green and white represent the changing of seasons; green represents summer foliage, white represents winter snow, yellow represents the fall colours, and red represents the vivid floral colours of spring. For Lupus, the colours orange represents the summer sun, white represents the winter snow, brown the autumn, and yellow the warming of spring. Also note the diagonal is reversed for the Temperate Circle of Lupus.

Note that the Earth is not a perfect sphere but more of an ellipsoid. Consequently the middle point between the Equator and poles is not precisely 45 degrees. However since 45 degrees represents a mean mathematical centre point, due to the Earth's bulge at the Equator, the middle point is slightly closer towards the Equator. But then again one could be more pedantic, because in reality the Earth is more like a meatball with uneven areas making the middle point between the Equator and poles nearly impossible to identify.

Part B The celestial sphere

B1: Star positions

Another application of the colour metric concerns the celestial sphere. Again the colours convey the same information but the pattern differs. In this case the emblematic star has been replaced with two dart emblems.[23]



Proposed flags: ascension and declination of star system Regulus

The two divisions of the flag represent the declination and right ascension. The fly portion represents the declination, which is perfectly parallel to the earthly latitudes in numerical value. Near the hoist region is the right ascension, which is similar to longitude but differs greatly in its numerical ordering. Instead of 179 degrees east or west, 'celestial longitude' is divided into 24 hours followed by minutes and seconds, instead of 360 degrees each divided by minutes and seconds.[24]

With celestial coordinate flags, the celestial hour is represented by two middle vertical lines, which can hold values from 01 to 24. To the left is a horizontal

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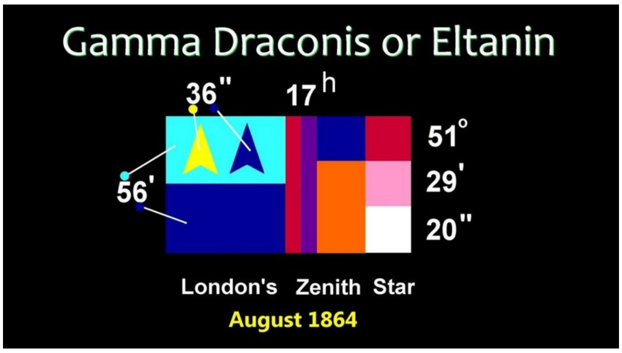
23 To me, the 'upward dart' emblem has deep associations with space through Gene Roddenberry's *Star Trek* television series. The dart was an emblem of the fictional future space travellers and also forms part of the symbol of the modern Russian space agency – perhaps more than a coincidence. See http://eng.mil.ru/en/structure/forces/cosmic.htm [also] https://en.wikipedia.org/wiki/ Russian_Space_Forces

24 Gater and Vamplew, *Practical Astronomy.*

division that conveys the minutes, the upper half is the 10s digit value while the lower portion is the 1s digit value. Finally the darts themselves represent the seconds as read from right to left for the values 00 to 59.

On the right fly side is a six-sided grid. Each of the two squares represents a two-digit portion of declination. At the top are the degrees, in the middle are the minutes, and along the bottom are the seconds.



Proposed flag: Gamma Draconis.
http://www.constellationsofwords.com/stars/Stars_Declinations.htm [and]
https://en.wikipedia.org/wiki/Gamma_Draconis

B2: Constellation flags

Another application of the colour metric involves the representation of an entire constellation. Since we are no longer concerned with a point but rather a range of areas, a different pattern is used.

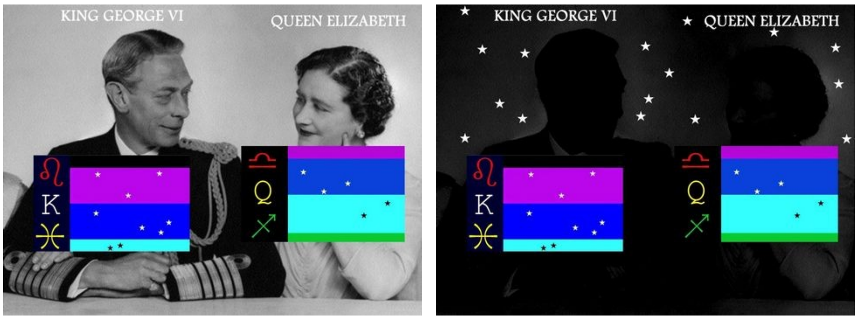
In this case the range of a constellation's declination (celestial latitude) is represented by a horizontal band of colours reflective of degrees. But only a general range of the degrees of declination is given. These flags are not so precise, since the celestial sphere is always moving. But the key is to remember that earthly and celestial latitudes are congruent such that if one lives upon the band of 50 degrees north, and a 50 degree band is present, then part of the constellation will appear directly overhead during some part of the year.

The generalised star pattern is also present to help one understand celestial latitude. But stars are usually coloured black to provide contrast to the bands of each flag, while some are coloured white for clarity and contrast.

For example, if a given constellation crosses any part of 30 degrees north then it will have a yellow band. Thus the horizontal bands represent a generalised range of celestial latitudes.

Along the fly we have information that conveys right ascension (celestial longitude). In this case the astrological signs parallel to celestial longitude indicate when the latitude and season when a constellation is best visible. The upper zodiac symbol indicates the earliest month of maximum visibility, while the lower symbol indicates the latest month.

If a small constellation falls totally within the span of a single month, then its zodiac sign will be repeated. But unlike astrology, the hourly right ascension assignment happens when the constellations are visible in the night sky, not when they are in their astrological positions.[25]



Celestial geography flags: King George VI (14 December 1895 - 6 February 1952) and Queen Elizabeth (4 August 1900 - 30 March 2002). Photo: http://ilovetheroyals1.tumblr.com/

For example, if one were born an Aries, i.e. between mid-March and mid-April, nowhere is the constellation of the same name visible from the planet. When the group of stars labelled as Aries are behind the sun that is when Aries totems are assigned to a particular individual who was born during that time period. Yet, importantly here Aries is nonetheless associated with March and April, which is the basis for the right ascension assignment. Thus for constellation flags the symbols of the zodiac reveal the months when a constellation is visible, and not to which zodiac constellations it is near or in matching celestial longitude, upon the celestial sphere.

But note the procession of the zodiac is out of line with reality. In fact, the zodiac marks on the fly side of these constellation flags represent a general common time of visibility with respect to the celestial sphere.[26] Like any model or map, it is only an estimate but one that closely resembles reality.

In the middle of the zodiac symbols are icons for the constellations. Many designs were drawn or modified from previous sources.[27] Others are completely original of my own design.

The colours of the symbols also indicate the position of a constellation with respect to the galaxy. If a constellation is on the northern side of the galaxy then the symbols are coloured red. If it is on the southern side of the galactic plane then they are coloured green. If they cross into the plane of the Milky Way then they are coloured yellow. As some constellations cross both the northern and southern galactic planes, they will have a red, yellow, and green pattern. A few constellations lie totally within the galactic plane, so the flags for these internal-galactic constellations will have white zodiac monthly visibility indicators and their symbol is white. This is the case with Scutum (the Shield), Crux Australis (the Southern Cross), Sagitta (the Arrowhead), Circinus (the Drawing-Compass),

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25 Julia and Derek Parker, *Parkers' Astrology, the Definitive Guide to Using Astrology in Every Aspect of your Life* (Dorling Kindersley, 2009).

26 Ibid.

27 https://www.suberic.net/~dmm/astro/constellations.html
From this website every official constellation in the night sky was given a symbol in the manner of the Western astrological zodiac. I have borrowed many designs directly, or modified them for my own use.

and Norma (the Set-Square).[28]

Constellations
Circinus and Norma

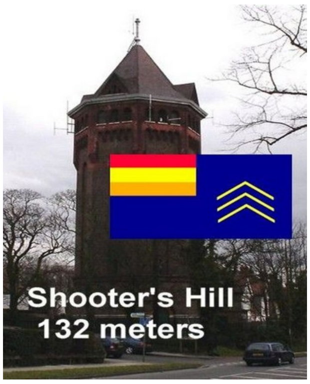
Red and green respectively were chosen to represent the northern and southern regions of the galactic plane on the basis of the almost perfectly balanced constellation of Orion on the celestial sphere. The most famous northern star of Betelgeuse is a red star and beacon for the northern region of the Celestial Sphere, while Rigel is a blue star and beacon for the southern region of the Celestial Sphere.[29] But remember, Orion is tilted towards the Southern Galactic Plane and does not reach the northern side of our Milky Way Galaxy.

So what are the uses of these flags? They encourage knowledge of celestial geography. Likewise should a star be directly overhead, they are useful to persons who happen to live under certain stars, establishing further connectivity with the universe at large. They also represent a cross-discipline endeavour to expand vexillology into other scholarly domains.

Part C: Altitude flags

C1: Generic altitude flags

Colour coded to number flags can easily code for information across several disciplines. Applying this vexillological colour code to altitude is possible and easily accomplished. For generic altitude flags, the design of a field with a canton is used.



Proposed flag: Shooter's Hill, Greenwich. Photo: Wikipedia

Starting with a local example, the highest point in the London (UK) Borough of

28 Gater and Vamplew, *Practical Astronomy*.

29 Ibid. Rigel and Betelgeuse are positioned like a traffic signal in the night sky. For clarity, however, green replaces the traditional blue to represent constellations on the southern side of the galactic disc (not necessarily for the southern skies). Our planet spins on an axis out of tilt with the plane of the Milky Way.

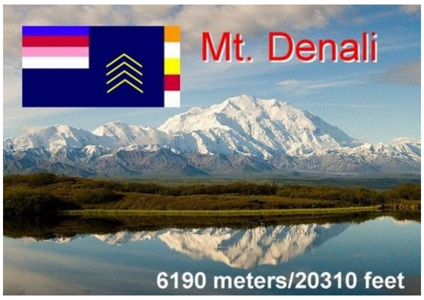
Greenwich Borough is at Shooter's Hill, standing at 132m above sea level.[30] Thsi three-digit number is represented by three horizontal stripes, each coded for a separate element: red-1, yellow-3, and orange-2. The field is navy blue with three upward marks to further clarify the reading of digits.

To represent an altitude of 222m, the use of 'lambda icons' can clarify the difference between 2m, 22m, 222m or 2222m, applying one, two, three, or four upward lambda ticks respectively.

These principles can also be applied to altitudes that are below sea level. However the digit indicator in the field will point downwards instead of upwards, looking like the letter V.

Altitude metric flags should be relayed in metres but for places like the United States that retain a profound attachment to the old British Imperial units (e.g. feet, pounds, miles, and inches) the fly end can have an optional 'vertical stripe' that indicates a measurement in feet.

For example for an altitude flag for the USA's highest mountain, Mt Denali (formerly Mt McKinley), will have a fly stripe broken into five coloured squares reflective of 20,310ft: orange-2, white-0, yellow-3, red-1, white-0.[31]



Proposed flag: Mt Denali (formerly Mt McKinley), the highest peak in North America

C2: Highest within a league

Furthermore creating merit flags for the highest point within a nation, county, district, city, or specified area is possible. In the following example the shape of the flag denotes that this point is the highest in its particular league.

The shape of the flag is based upon the flag of Nepal in order to highlight the unique position of an altitude within a certain class, as Nepal's unique flag design is associated with the highest mountain on the planet, Mt Sagarmahthah (Mt Everest).[32] However the orientation of the stripes is changed from horizontal to vertical.

Scafell Pike, for example, qualifies for a flag of this type as it is the highest point

30 http://www.royalgreenwich.gov.uk/info/200064/local_history_and_heritage/150/shooters_hill
31 https://www.livescience.com/40595-denali-mount-mckinley.html
32 Mount Everest has multiple names listed on the UN website, http://whc.unesco.org/en/list/120

within the geographic domain of England. Standing at 978m,[33] Scafell Pike's flag has a pink stripe at the hoist representing the 100's digit value, a violet stripe representing the 10's digit value, and the remaining black field represents the 1's digit value, to be read as 978m.

The field has two spaces for a badge. Badges that represent the particular class of a flag must be decided by the flag designer. As a general rule the lower badge should be an icon representative of the larger area, and the upper badge should be an established local icon representing the immediate vicinity.

Here, since Scafell Pike is England's highest peak, the lower portion of its flag has an English Red Cross badge. In the upper triangle, the roundel is based upon the flag of the local Cumbria County Council.[34] Scafell Pike consequently has two flags; one to denote that it is England's highest point and a generic canton marker flag.

Proposed flag: Scafell Pike, England's highest point. Photo: Wikipedia

In another example a marker flag is shown for the highest point in the British Isles: Ben Nevis, Scotland. Ben Nevis stands at 1,345m above sea level,[35] so its altitude flag consequently has four stripes. From hoist to fly these are red-1, yellow-3, green-4 and cyan-5. The bottom badge is that of the UK and the upper badge is based upon the Scottish saltire.

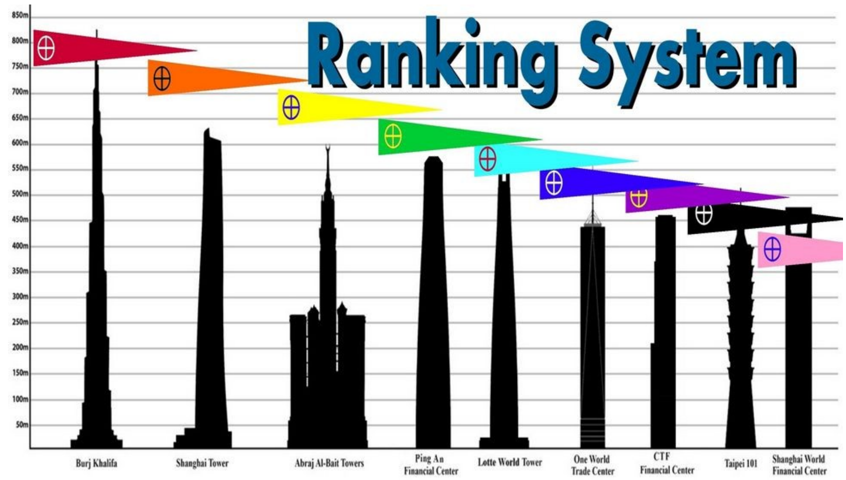
Proposed flag: Ben Nevis, highest point in the British Isles. Photo: Wikipedia

C3: Man-made heights, ranked in order

Besides natural high points, another type of altitude flag can be designed for man-made objects, or rather woman-willed constructions. The generic altitude flags with canton stripes and field are appropriate for any type of building. But if such an artificial structure is a record holder within a certain geographic class, then a special flag is warranted, with a change of design to indicate that this altitude is artificial. The design chosen is a long pennant with a single badge

33 https://www.scafellpike.org.uk/?v=7516fd43adaa
34 https://commons.wikimedia.org/wiki/File: County_Flag_of_Cumbria.svg
35 https://en.wikipedia.org/wiki/Ben_Nevis

representing the geographic domain. But for these altitude rank flags, the colour of the long pennant does not indicate a measurement but a rank. Currently the world's tallest building is the Burj Khalifa in the United Arab Emirates, which stands at 828m above sea level[36]. Thus Burj Khalifa qualifies for the long red pennant with the symbol for Earth as its badge. The astronomical/zodiac symbol of the Earth is coloured according to the assigned contrast indicator.



Proposed flags: world's tallest buildings. Diagram, Wikipedia

The second tallest building is China's Shanghai Tower at 632m.[37] Thus China is the current owner of the long orange pennant bearing the Earth icon. Saudi Arabia holds the third-place yellow pennant with its Abraj Al-Bait Clock Tower at 601m.[38] The United States has the sixth-place blue pennant with World Trade One at 541m.[39] As new buildings grow ever higher, ownership of the long pennants will change as well. Within the geographic domain of the United Kingdom, the Shard building warrants a long red pennant with a UK badge.[40]

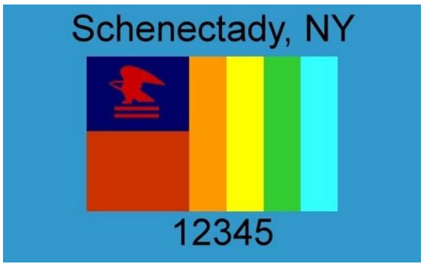
Proposed flag: the Shard, the UK's tallest building.
Photo, Wikipedia

36 http://www.burjkhalifa.ae/en/the-tower/ factsandfigures.aspx
37 http://www.skyscrapercenter.com/building/ shanghai-tower/56
38 https://en.wikipedia.org/wiki/Abraj_Al_Bait
https://www.skyscrapercenter.com/building/makkah-royal-clock-tower/84
39 https://en.wikipedia.org/wiki/ One_World_Trade_Centre
40 https://www.skyscrapercenter.com/building/the-shard/451
https://www.the-shard.com/

Part D: Numbered zones

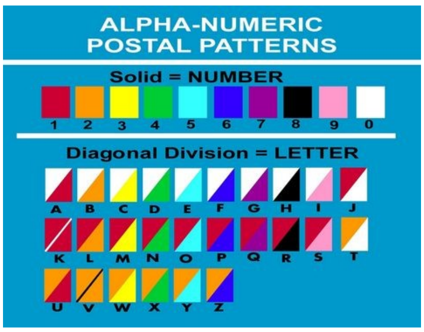
Zones are another area where the colour-coded digit system can be put to work. One popular example is the postal zone. In the United States postal zones are all numerical,[41] so a canton-style flag was used, combined with the official US postal emblem of a stylised bald eagle.[42] Within the field are the specific numbers of a postal code, reflected in a vertical stripe pattern. Contrast indicators are not used with these flags.

For example, the US zip code 12345 lies in Schenectady, New York.[43] Since the first number of a US zip code represents one of nine major postal zones covering several states, the colour of the flag extends to match the canton area to its end. Additionally the bald eagle is coloured according this initial number.



Above, proposed zip code flags, colour/number system;
below, proposed zip code flag, Schenectady NY, 12345

The UK and Canada include letters in their postal codes. In order to distinguish numbers from letters a pattern approach is used to remove any potential confusion.



Zip code flags, including alphanumeric postal codes

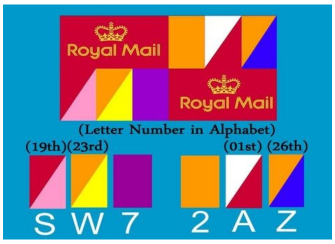
Solid colours always refer to numbers, while any part with a diagonal represents a letter, based upon their numerical position of one (A) to twenty-six (Z). Since the letter K is the 11th letter, a white-stripe contrast indicator is used. Likewise the letter V is the 22nd letter, so a black stripe clarifies this issue.

41 https://www.usps.com/

42 Ibid.

43 https://en.wikipedia.org/wiki/Schenectady,_New_York

Since UK postal codes have two parts, a quasi-heraldic design is used. In this case the Royal Mail logo is repeated in Quarter 1 and Quarter 4, while the particulars of the alphanumeric code follow in the order of natural reading: the first half is displayed in Quarter 3, closer to the hoist; the second half is shown in Quarter 2, closer to the fly. The same pattern fits the Canadian postal system but using the Canadian mail logo instead[44].



Proposed postcode flag:
Imperial College, London, SW7 2AZ

Proposed postcode flag:
Canadian Postal HQ, K1A 0B1

These flag systems can also have applications to any organisation that makes use of numbers and letters to designate a particular group: military units, shuttle missions, scouting troops, corporate divisional districts and regions, building address letter/number, parking lot numbers, or government zoning designations. Essentially any area that has a number or letter associated with it can effectively utilise this colour metric.

Part E: Uncharted international areas

E1: Duty-free zone flag

International spaces are areas that currently are officially unflagged. One space where the laws of government become ambiguous is the duty-free zone.[45]

Proposed flags: miscellaneous uncharted international areas

Since any such zone lies outside normal territorial jurisdictions, a flag to denote

44 https://www.canadapost.ca/web/en/home.page

45 https://en.wikipedia.org/wiki/Duty-free_shop

its special status is possible. The duty-free zone flag presented here is useful as a signal icon that can quietly broadcast this information.

The proposed duty-free zone flag is quartered into four areas repeating a pattern. The first and fourth quarter have a black and green checker pattern of 5 by 3. The second and third quarters are empty white fields.

Green was chosen since it is a colour of abundance, associated with a bountiful harvest from the mostly green plants. The white portions signify the openness of the partially international aspect of the duty-free zone.

E2: International Maritime Zone flags: EEZ

Building on the ambiguous international economic/political zones, nations with international coastal zones are ripe for new flags marking the various maritime areas. Beyond the easily measured and determined land borders, international maritime areas can also use flags.

The United Nations Convention on the Law of the Sea of 10 December 1982 grants a 12-nautical-mile offshore claim as national sovereign waters.[46] Unless impeded by another nation or negotiated by treaty, this extended offshore 12-nautical-mile claim is international law.[47] Areas further out to sea are considered international spaces, but a nuanced legalism gives certain rights to adjacent nations. These areas include the Exclusive Economic Zone, the Contiguous Area, and the Extended Continental Shelf. Some of these maritime areas overlap. Nonetheless a flag for each zone is possible.

For most maritime powers, the largest of these areas is the Exclusive Economic Zone.[48] This zone is officially international waters, as any nation has a legal right to cross it, yet a particular nation will have an exclusive economic monopoly with rights to the water column and resources that lie in and under the seabed.

The first EEZ flag is of a general international type that can be used by any nation. This flag should be directly flown under a national ensign to indicate that a ship is within the nation's Exclusive Economic Zone. This flag can also be flown on an anchored buoy. The design of the international EEZ flag is similar to the Duty-Free Zone flag, since both indicate an ambiguous international area, dealing with economic activity. In this case the first and fourth Quarters are white, while the second and third Quarters are a vertical tribar of black, green, and black.

Another option is to create EEZ flags that inherently reflect a sovereign nation's flag. Two types of EEZ flags of this nature are presented in this paper. The first type preserves the pattern but substitutes the colours: green, black, and white. Nations that have a distinct pattern fall into this category, examples being the flags of the UK, USA, Canada, and North Korea. Due to the recognition of a

46 http://www.un.org/Depts/los/convention_agreements/convention_overview_convention.htm

47 Ibid. The convention came into force on 16 November 1994, 12 months after the relevant article 308 was signed by a 60th nation. Most important in this article are the expansion of the Exclusive Economic Zones to 200 nautical miles for coastal states, and conditions to expand certain areas of the maritime shelf.

48 http://www.gc.noaa.gov/ gcil_maritime.html

specific pattern, these flags sharply convey a nation's identity.

Proposed International Maritime Zone flags: based on modified national flags

The second type of EEZ flag is a modified version of the quartered EEZ flag. The need for this type of flag is based upon the numerous tribar flags whose patterns are non-distinguishable. Basically these flags repeat a nearly identical version of the official national flag in the first and fourth positions. Nations of the type include Netherlands, Senegal and Norway. Instead of repeating the whole colours of the international EEZ tribar, one colour from this palette is chosen to provide clarity and contrast, either green, black, or white.

Proposed International Maritime Zone flags: for countries with a tribar national flag

E3: International Maritime Zone flags: Contiguous Zones

Approaching the edge of a nation's sovereign waters towards the open sea, another unique international zone comes into force, the Contiguous Zone.[49] This maritime zone is where a nation's police and law enforcement agencies have rights to arrest or board a ship in protecting that nation's maritime shores. Nations retain rights to protect their areas if a suspect boat should be carrying undocumented persons, illicit substances, or performing unauthorised economic activities. This international zone extends for a further 12 nautical miles further from the edge of a nation's sovereign national waters.[50]

The generic international flag for a Contiguous Zone consists of a black field with an orange sinister bend. This flag was designed as a warning flag that a ship is nearing a sovereign nation's territorial waters and may be subject to a security search if caught within this pursuit zone. Also note, the Contiguous

49 http://www.gc.noaa.gov/gcil_maritime.html#contiguous
50 Ibid.

Zone is completely under the EEZ of the adjacent nation.[51]

As with national EEZ flags, modified national flags with Contiguous Zone colours can be combined to create distinguishable flags. The colours for a national Contiguous Zone flag are black, orange, and white. These colours were chosen because they indicate a natural urgency, as seen in the pattern of bees, tigers, and wasps.[52]

Once again, where a nation has a flag with a distinctive pattern – e.g. the UK, Japan, Australia, and the United States – a simple substitution of Contiguous Zone Colours is applied.

Nations with less distinct patterns have flags based upon the pattern of the generic international Contiguous Zone flag. For flags that are horizontal tribars, the colours are conserved within the bend. But the bend starts on the hoist and finishes on the fly, such that it never touches the top or bottom portion of a flag. In addition one or two of the contiguous colours (black, white, or orange) fills up the remaining field. A national icon can be present in the canton area to enhance recognition of a nation's contiguous waters. Examples of nations with horizontal deigns include Germany, Ghana, and Cambodia.

For national flags that are vertical tribars, the colours are also conserved within the bend, but the sinister bend extends from the bottom to the top, never touching the hoist or fly side of a flag. Nations of this contiguous design include the Ivory Coast, Mexico, and Nigeria.

E4: International Maritime Zone flags: Extended Continental Shelf

Another special maritime zone is the Extended Continental Shelf. It is similar to the Exclusive Economic Zone but pertains only to sea floor, not including the water column above.[53] Consequently, any nation is allowed to fish these waters but is not allowed to exploit resources on or under the sea floor.

The generic international sea-floor flag is a field divided diagonally. The portion nearer the fly has seven stripes in a sinister orientation. The seven stripes are reflective of the legendary seven seas of lore. The colours of the fly-side stripes are neon green, yellow, and black. The flag colours are reflective of the free economic zone colours established above, but with the addition of yellow. Although this flag could be flown underwater, it should also be flown under a national flag when the EEZ area has been exhausted. Extended Continental Shelf flags can also be flown from buoys anchored to the limits of the claimed

51 Ibid.

52 http://www.amnh.org/explore/news-blogs/on-exhibit-posts/warning-colors-in-the-animal-world/ The colours were also partly influenced by the corporate livery of 'Big Lots! Inc.', previously as known as 'Odd Lots', a US discount chain store that started in Ohio. It is famous for buying non-standard buyout items. Consequently nearly half its inventory are random products on the fringe of retail, sold at discount before being recycled or thrown away. I discovered this non-standard, unconventional inventory when I was working there. Inspiration for flag design can come from anywhere. The combo of 'Big Lots!' non-standard retail and the warning colours of the animal kingdom seemed like a good colour pattern for the contiguous maritime zones.

53 http://www.gc.noaa.gov/gcil_maritime.html#shelf

Extended Continental Shelf.

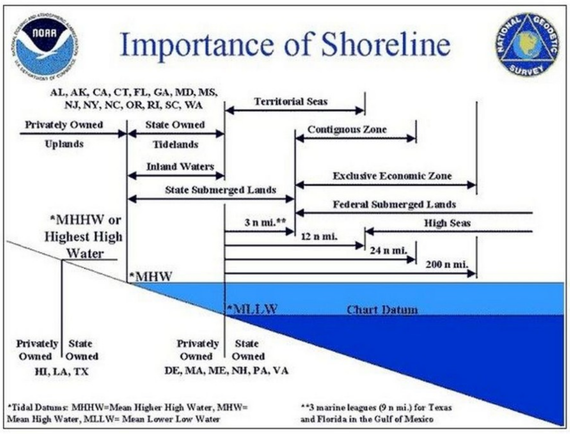
As with the EEZ and Contiguous Zones, modified national Continental Shelf Flags can be created. In this case the colours of the stripes should be modified to match the colours of the nation and within the fly area a national emblem can suffice to indicate the nationhood of a particular area.

In one example, New Zealand's Extended Continental Shelf[54] flag can be described. The seven stripes from the upper fly are white, blue, red, blue, white, blue, red. The fly field is blue and the Southern Cross pattern of New Zealand's national flag is present.

Part F: Uncharted sovereign areas

Nations have yet to design a distinguishing flag to indicate sovereign national waters. Typically sub-national areas have flags of their own, as with the 50 US states or the 47 prefectures of Japan.

The sovereign maritime waters of the USA are divided into state and federal waters, subject respectively to state or federal laws, with consequent effect on economic and criminal activity conducted in these waters.[55] A flag could therefore be issued to mark federal waters, showing whether state or federal law applies.[56]



US coastline jurisdictions

Furthermore persons born in federal waters deserve a flag denoting that they were born officially in US territory, but not in any of the 50 states or other unincorporated areas on land, making this a birthright flag for persons born beyond any of the maritime borders of the fifty states.

In the United States the 12-nautical-mile limit is divided between state and federal waters.[57] Most states have a claim that extends three nautical miles from the shoreline. The other nine nautical miles fall under federal

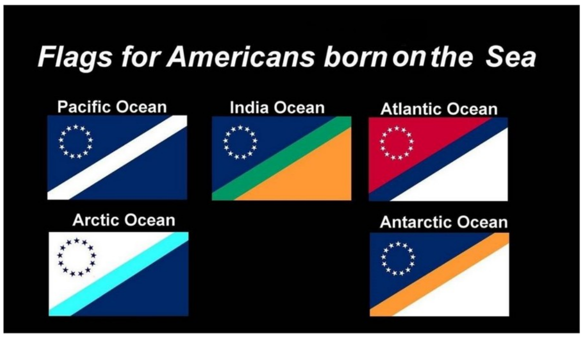
54 http://www.linz.govt.nz/about-linz/what-were-doing/projects/new-zealand-continental-shelf-project/map-continental-shelf

55 https://www.boem.gov/Federal-Offshore-Lands/

56 http://www.uscourts.gov/about-federal-courts/court-role-and-structure/comparing-federal-state-courts

57 https://www.nauticalcharts.noaa.gov/staff/ law_of_sea.html

jurisdiction.[58] However, Texas and Florida have an extended claim to nine nautical miles within the Gulf of Mexico, with the remaining three nautical miles falling to federal jurisdiction.[59]



Proposed flags: US citizens born at sea

This birthright clause also applies to persons born in the Exclusive Economic Zone, Contiguous Zone, or Extended Continental Shelf Area. But note that these are international rather than sovereign waters and do not guarantee citizenship.

There is also a potential need for birthright flags to indicate birth in the air. This is a relatively new phenomenon but is occurring more frequently as more persons travel by plane.[60]

Proposed birthright flag: US citizens born in the air

Using the United States as an example, there are three classifications for persons born in certain airspaces: a flag for Domestic US Airspace, a flag for Alien Non-US Airspace, and a flag for International Unclaimed Airspace.

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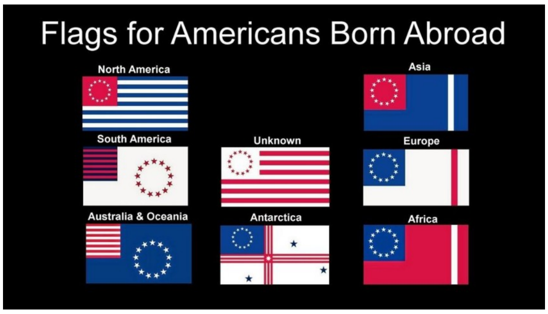
58 http://www.gc.noaa.gov/gcil_maritime.html#contiguous

59 Ibid.

60 As I was editing this article, the birth of such a baby made news headlines. According to the *New York Post*'s Yaron Steinbuch, Christoph Carsten Lezcan was born on a Spirit Airlines flight from Fort Lauderdale to Dallas. His mother, Cristina Penton, was then 36 weeks pregnant. The flight diverted to New Orleans, but Ms Penton's waters broke about 35 minutes into the flight. Christoph weighed 7lb and was 19.5in long. Spirit Airlines said mid-flight births are rare and offered Christoph free flights until his 21st birthday. Christoph was also born under this flag and has entered the halls of vexillology, http://nypost.com/2017/06/28/airline-gives-baby-born-on-plane-21-years-of-free-flights

Similarly, birthright flags can be created for US citizens born outside the US, on foreign soil. In this case flags for each continent have been created for persons born abroad. Finally the last group of birthright flags covers US citizens born on one of the oceans: Atlantic, Pacific, Indian, Arctic, or Antarctic.



Proposed birthright flags: US citizens born abroad

Part G: Antipodal flags
Creating flags for special geographic areas is another vast non-flagged frontier. One novel area is flags for antipodal areas of the Earth.[61]

The paramount flag to indicate an antipodal area is presented here. It is a modified yin and yang symbol, chosen for its dual representation of opposition yet at the same time harmony. The flag adopts the cyan, green, brown and white of the official flag of the National Geographic Society,[62] bordered by the yin and yang. The antipodal flag also has a tilt that reflects the Earth's tilt at 23 degrees relative to its orbit.[63] The generic Antipodal International flag is for use by any nation that has an antipodal area.[64]

Proposed Antipode flag

On the next level down, antipodal flags reflecting pairs of antipodal nations were also created. These flags combine the national flags of the two nations.

A person standing in an antipodal area is also standing directly on top yet also beneath another nation. These flags establish a direct and positive connection between nations. They were designed with an educational purpose, but also with the intent to expand the mind of the viewer about the world and to

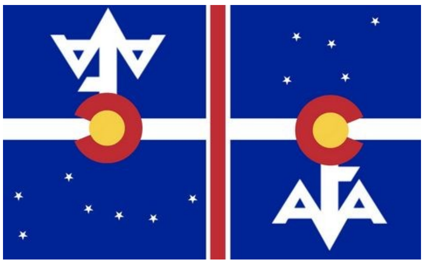
61 https://en.wikipedia.org/wiki/Antipodes
62 http://www.nationalgeographic.com/explorers/national-geographic-flag/
63 https://www.universetoday.com/47176/earths-axis/
64 https://en.wikipedia.org/wiki/Antipodes

establish a harmonious connection between nations.

Proposed antipodal flags: two national flags combined

On a further level down, it is possible to create sub-national antipodal flags. Happily for the United States, three states that have 'Good Flags' are antipodal: Alaska, Colorado, and Hawaii.

It is also possible to connect directly from sub-national flag to sub-national flag. This is the choice of the flag designer. In this paper, the sub-national flag of the US state of Colorado[65] has been combined with France's Kerguelen territorial flag. Furthermore flags can also be created for antipodal cities.[66]



Proposed sub-national antipodal flag: Colorado-Kerguelen line

Part H: Time flags

H1: Time zone flags

Among the most unusual zones crossing and linking nations are time zones. These zones have real impact on all sorts of persons from academics, tourists, and businesses alike. It is overdue that these ubiquitous and important geographic areas are given unique flags to represent their domains.

Since the world is divided into 24 natural times zones, the 24 signs of the combined Eastern and Western zodiacs were chosen. The zodiacs are universally recognisable totems over which no one culture has a monopoly. Beyond the non-scientific conjectures associated with astrology, there are logical elements to this art that give it a partial, if fleeting, connection to rationality. Foremost among these is their relationship to the scientifically

65 Randy Howe, *Flags of the Fifty States and Their Incredible Histories* (Lyons Press, 2002).

66 To identify antipodes by coordinate, see https://www.antipodesmap.com/

measured reality of geography; geography of the heavens, but geography nonetheless.

Each of the two zodiacs is composed of 12 signs[67] Since the Eastern zodiac is associated with China and the East, it makes sense to apply these totems to the 12 time zones east of the Prime Meridian.

For positive +UTC offsets of Universal Coordinated Time, hours are linked to the positions of the Eastern zodiac. Thus the order of the Eastern zodiac matches to the hourly positive offset. Since the Rat is the first sign of the Eastern zodiac, it represents the +1:00 UTC offset. The second sign is the Ox to represent +2:00 UTC. The third is the Tiger to represent +3:00 UTC. The fourth is the Rabbit to represent +4:00 UTC. The fifth is the Dragon to represent +5:00 UTC. The sixth is the Snake to represent +6:00 UTC. The seventh is the Horse to represent +7:00 UTC. The eighth is the Sheep/Goat to represent +8:00. The ninth is the Monkey to represent +9:00. The tenth is the Rooster to represent +10:00 UTC. The eleventh is the Dog to represent +11:00 UTC. The twelfth is the Pig to represent +12:00 UTC.

Proposed time zone flags: Eastern Hemisphere

For negative -UTC offsets the order of the Western zodiac is used. Coincidentally this area is the Western Hemisphere. Since Aries is the first sign, it represents -1:00 UTC. The second is Taurus to represent -2:00 UTC. The third is Gemini to represent -3:00 UTC. The fourth is Cancer to represent -4:00 UTC. The fifth is Leo to represents -5:00 UTC. The sixth is Virgo to represent -6:00 UTC. The seventh is Libra to represent -7:00 UTC. The eighth is Scorpio to represent -8:00 UTC. The ninth is Sagittarius to represent -9:00 UTC. The tenth is Capricorn to represent -10:00 UTC. The eleventh is Aquarius to represent -11:00 UTC. The twelfth is Pisces to represent -12:00 UTC.

The flags of the negative or Western Hemisphere time zones utilise icons already in use for the Western zodiac. However for the Eastern zodiac modified westernised symbols are used. So why not use Chinese symbols? There are

67 James R. Lewis, *The Astrology Book, The Encyclopedia of Heavenly Influences* (Visible Ink Press, 2003). A great resource about the zodiacs of East and West. Although a non-scientific subject, this book is scientifically written.

already several Chinese characters that represent the Eastern zodiac. But for the sake of simplicity, new symbols in similar tone to the Western zodiac were created, partly because the Chinese have already created translated symbols for the Western zodiac. Accordingly, it makes sense for the Occident to catch up and create Western symbols for the Oriental zodiac.

Secondly, the symbols of the Occidental zodiac are not representative of one particular nation. A primary intention of time zone flags is to connect and link different cultures and societies. Using Chinese symbols gives too much national identity to one nation. Since Western zodiac symbols exist outside the normal realm of the standard English, Greek, or Latin alphabet, it makes good sense to use symbols that lie outside the Chinese writing system.

Proposed time zone flags: Western Hemisphere

The majority of flags are fields divided across. For the Eastern Time Zones, the division is a regular bend division and for the Western Time Zones the division is a sinister bend division.

Time zones with even hours have stars in the lower portion upon a black field, while time zones with an odd hour have stripes along the bend division.

For even time zones the number of stars matches the hour, but for odd time zones the number of stripes plus the two fields matches the hour. For example since Leo is the fifth sign of the Western zodiac, it will have three stripes along the middle, plus two for the larger triangular fields giving a total value of five.

For the first nine time zones in either hemisphere the field colours with the zodiac symbol match to the colour metric, as initially presented in this paper.

However, exceptions apply to a few time zones. For both the +1:00 and -1:00 a single star and no stripes were used. The number 1 is a peculiar number deserving a special pattern. Furthermore, one stripe would accidentally indicate a quantity of three. So a single red star helps to alleviate this potential confusion.

Flags for the +2:00 and -2:00 time zones have symbols of the Eastern and Western zodiacs. This is done to honour the duality of coincidence of cattle in the second position of each zodiac. For GMT or UTC 0:00 a unique flag is used. It is the only tribar style that uses the Taurus symbol. Taurus was chosen due to the synchronicity of a cow in the second place progression in both the Western and Eastern zodiacs.[68]

For the time zones outside the zodiac – which include the extra early, more than the natural 24 hours, time zones of +13:00 UTC and +14:00 UTC – flags have been made based on constellations that edge into the celestial ecliptic yet are not considered apart from the 12 signs of the zodiac.[69] In this case the Eastern +13:00 time zone is tied to the constellation of Ophiuchus the Serpent Holder. Ophiuchus is nestled between Scorpio and Sagittarius and is directly crossed by the ecliptic. Finally the +14:00 time zone is tied to Sextant the Star Compass. Sextant is snuggled in a corner next to Leo, just peeking in on the ecliptic – which is the apparent pathway of the planets in the night sky.[70]

For time zones that are on a 15-, 30-, or 45-minute offset, a crescent moon serves as the offset indicator. The position of the crescent moon indicates the minute offset. For example since Iran is +3:30 UTC it is assigned the third symbol of the Eastern zodiac and has a crescent moon. The thickest portion of the moon is facing downwards, with the two horns pointing upwards, denoting a 30-minute offset. For a 15-minute offset the horns of the moon point towards the hoist, while for a 45-minute offset the horns of the moon point towards the fly.

Note that the colour code is not applied strictly for Time Zone flags. In this case, the colour code is used as a guideline rather than a stringently codified manual, as flag codes are sometimes considered. Time Zone flags demonstrate that a strict application is not always necessary.

H2: Temporal rank flags

Besides time zones, another area lacking in vexillology are badges of temporal rank. For this exercise, the symbol of a heavenly body can be utilised. Temporal marks of rank can easily be applied to flags, but temporal badges of rank can be applied to any sort of organisation. In this case the popular symbol for any one of the planetary bodies denotes the temporal rank. Essentially the symbols indicate the passage of time, relative to Earth. Each symbol above the rank of a month marks the amount of time it takes to complete an orbit around the sun.

For example, since Mercury takes about three months to complete an orbit, its symbol/badge represents three months of association or service.[71] Consequently, any person who has given one year of service is promoted to the Earth rank. Persons with two years of service equate to Mars Rank, Jupiter represents 12 years of service, Saturn represents 30 year, and Uranus represents 84 years.[72]

Other minor planetary objects fill in the gaps between the major heavenly

68 Ibid.

69 Gater and Vamplew, *Practical Astronomy*

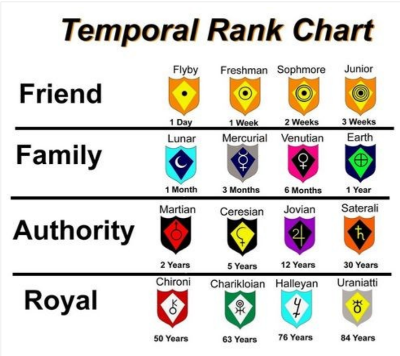
70 Ibid. Note also: -13:00 and -14:00 time zone flags were created to balance the extra early time zones of +13:00 and +14:00. Once again constellations that peek into the ecliptic were chosen. Cetus is next to Pisces, and Orion lies between Taurus and Gemini. They just barely edge into the ecliptic.

71 Ibid.

72 Ibid. Also note that Genesis 1:14 can be interpreted as stating that the stars (lights in the sky) can be used to track time: 'And God said, Let there be lights in the firmament of the heaven to divide the day from the night; and

bodies, including Ceres to represent 5 years of service, minor planet Chiron for 50 years, minor ringed planet Chariklo for 63 years,[73] and Haley's Comet for 76 years.

The symbol of the moon is used to indicate one month of service. For the Sun a single dot represents one day of service, while the regular sun symbol represents one week. Additionally rings accrue with each week, two rings meaning two weeks, and three rings indicating three weeks. There is no fourth week, as this would equate to one month.



Proposed temporal rank chart

When applying these badges to a particular organisation the colours should be modified according to the organisation's colours. Using NAVA as an example, here are the major ranks that can be gained by membership. In these instances the colours of NAVA are utilised to represent a member's temporal association.

Proposed temporal rank chart: NAVA

The specifics of logging time can be modified. Other issues to consider are: if a member becomes lapsed, if time earned only counts when a member is engaged and or on the clock. It all depends on an organisation's discretion.

Part I: Morse code

Morse code is also another area where colour-coded flags were utilised, but by using a modified application of the colour code: only the 1's digit value equivalent to a letter's numerical position was used to determine the background colour. The reason for this selective application is to help prevent confusion. These flags are presented here to show a different approach to the

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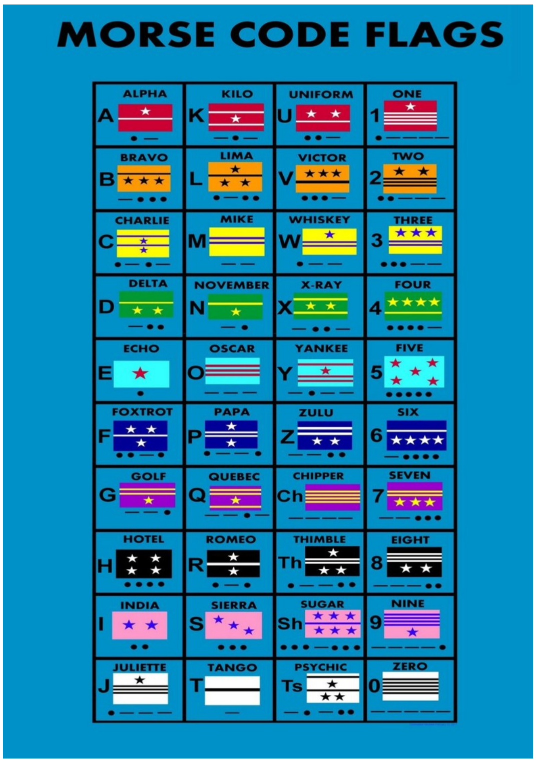
let them be for signs, and for seasons, and for days, and years.' Thus temporal rank badges mark an association of time with the lights in the sky.

73 https://solarsystem.nasa.gov/planets/10199chariklo/indepth https://en.wikipedia.org/wiki/10199_Chariklo

colour-coded numbering system. Please note the colour metric presented in the paper only serves as a guideline, and certain liberties can be taken at the discretion of the flag designer.

These new Morse code flags are directly reflective of Morse code. International maritime flags are sometimes erroneously known as Morse code flags, however these flags are not explicitly reflective of the dots and dashes, or rather dits and dahs of Morse code. But for these explicitly designed Morse Code flags, stars are read as dots, while stripes are read as dashes.

In a further example, some Morse code flags do not need to follow the colour-to-one digit value for a background colour. The best example is the SOS flag, which already has a striking pattern and retains the warning colours of yellow and black for high visibility.[74]



Proposed Morse Code flags

Part J: Geographic alignment flags

These flags establish connections and further serve as educational guides. Flags of this nature can be designed on any level with respect to particular border areas.

Of interest for education and tourists are special points of geography, such as meeting points or extremities. In the United States, for example, the Four Corners is a popular destination where a person can stand in four states at once. This is where Arizona, Utah, New Mexico, and Colorado meet.[75]

74 Lynn Araujo, *The History of Signaling* (US Games Systems Inc., 2006).

75 *Hammond's Modern Atlas of the World, with New Maps and New Census Figures of All Countries and Cities* (C.S. Hammond, 1926).

Similarly, in Canada the Four Corners brings together Manitoba, Saskatchewan, Nunavut, and the Northwest Territories.[76] Once again a composite flag was designed.

Proposed flags of convergence:
for points where several countries or states meet

More common are tripoints, where three areas meet.

The United States, UK, and Canada do not have such points but they do exist in much of Asia, Africa, and Europe. Examples of tripoint flags are the French/German/Swiss convergence flag or the Dutch /German/Belgian convergence flag.[77] These convergence flags may be applied to any political level be it local, sub-federal, or national.

Markers or flags for geographical extremities are also possible.

The furthest points of a given area often attract interest and tourism. Key West, Florida, for example, is the southernmost point of the continental USA, and the buoy marking the spot attracts many visitors, including the author.[78]

The alignment of one place with another opens up a whole new category of flags, based upon directionality and special points of interest. Of the island of Britain, Scotland is associated with the north and England with the south yet parts of England and Scotland share the same latitudes.

Indeed, one could argue that part of Scotland lies south of England and that part of England lies north of Scotland. It is for this geographic area, where areas of both countries share the same latitudes, that a flag can be issued.[79]

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76 Any political map of Canada or political globe made after 1 April 1999; or http://www.nrcan.gc.ca/earth-sciences/geography/atlas-canada/ reference-maps/16846

77 *Hammond's Modern Atlas*

78 http://www.planetware.com/tourist-attractions-/key-west-us-fl-keywest.htm

79 *Hammond's Modern Atlas*

Proposed flags: intercontinental latitude

Other flags which illustrate this principle are the intercontinental flags that show where continents cross by the four cardinal directions. The first group relates to latitude and the second group relates to longitude. But for these flags only the continental portion of the landmass is used to determine a boundary; including islands complicates matters.[80]

Proposed flags: intercontinental meridian

Part K: Cardinal directions

K1: Flags for the four hemispheres

Flags for the four hemispheres were originally created in 2013, on the blog *The Voice of Vexillology.*[81]

These flags were inspired by Eastern or Chinese cosmology which portions the celestial sphere into four areas. These four zones are associated with the four

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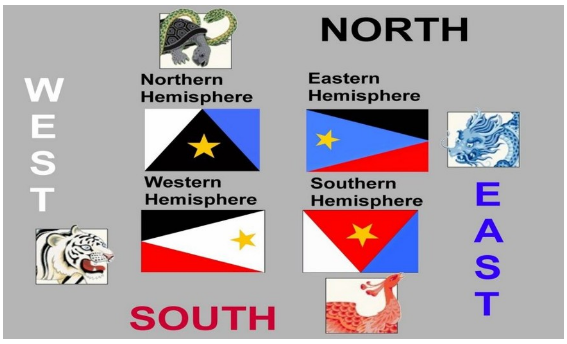
80 Ibid. I do not include islands because of the classification problems caused by unequal distance. The best example is Trinidad and Tobago, which lies less than 80 miles from continental South America but over 2,400 miles from continental North America. It is usually considered part of North America although it is geographically closer to South America.

81 http://zebratigerfish.blogspot.com/ I am the editor of this website which displays many of the original flags presented here. I welcome articles, please feel free to contact me by emailing the site or leaving a comment.

cardinal directions and with semi-mystical animals.[82] In ancient Eastern cosmology, east is assigned to the azure-blue dragon. The west is associated with the white tiger. The south is associated with the vermilion-red firebird or phoenix. And the north is associated with the black turtle and snake. In the central position is China and the proverbial yellow emperor. Using the congruent associations of colour to direction, four flags were created to represent the four hemispheres.



Proposed flags for the four cardinal points.
Images, http://idp.bl.uk/4DCGI/education/astronomy/sky.html

For the Eastern Hemisphere flag, blue is the dominant central colour. Due to the association of the blue dragon with the east, there is a blue triangle pointing toward the fly. Also note, the modern Western orientations of the four cardinal directions is used. In the modern sense when reading a map, the rightward/fly side is typically east, leftwards/hoist is west, upward/forward is north, and downward/inward is south. Since east is diametrically opposed to west, the white colour of the west is completely missing. But black and red are maintained to provide contrast and support for the eastward triangle. Finally, a yellow star points eastward towards the fly.

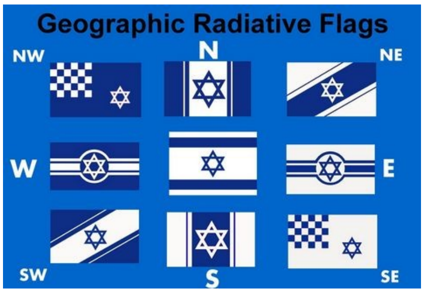
The opposing Western Hemisphere flag has a white triangle that points toward the hoist, or leftward side. It too has a central yellow star pointing in the opposite direction, towards the hoist. Missing is the colour blue, but the Western Hemisphere flag maintains black and red for contrast. The dominant colour is white as it is associated with the white tiger from the West. Finally, the central yellow star points westward to the hoist.

Since south is associated with the red of the phoenix, red is the largest component of the Southern Hemisphere flag. And the central yellow star points downwards. The colours blue and white are present as supporters but completely absent is the northern colour of black.

The Northern Hemisphere flag is predominantly black due to its association with the black of the turtle. Absent is red, since it is associated with the south. The white and blue areas are present for contrast as indicators of west and east respectively. Finally the central yellow star points upwards, in the modern standard reckoning of north.

82 These four coloured animals are often referenced in Japanese-pop anime culture. Younger generations should instantly recognise the connection and power of these icons.

K2: Radiative flags
Flags that represent directional alignments are another open door for flag designers. The inspiration for these types of flags come from the mileage or kilometre signposts pointing from a distance towards a famous city. These flags honour a city or place by making it the focus of the composition.



Example of a proposed radiative flag: Israel

In our example here we have the radiative flags of England and Israel. For the areas directly east or west of the honoured locality a horizontal tribar design should be employed. For the areas north or south a vertical tribar design should be chosen. For areas northeast to southwest a sinister bend should be utilised. And finally for areas northwest to southeast a checker canton pattern should be used.

For the sake of convention, flags that represent an area due east, south, northeast, and southeast should use brighter colours. This is because these sides are usually sunnier than the opposing sides, at least from the Northern Hemisphere. Using the basic cardinal directions, these flags can indicate the aligned areas relative to an honoured nation or city. It is important to keep these flags in similar general patterns, as they represent a new class of geographic flags: radiative flags.

K2: Consider the Poles, new and old
The North and South Poles are natural points on Earth, recognised by all nations. But there are no official or recommended vexilloids to honour these important points. By a cultural association with St Nicholas, or Santa Claus, a red and white spiralling pole has become the de facto pattern of the North Pole.

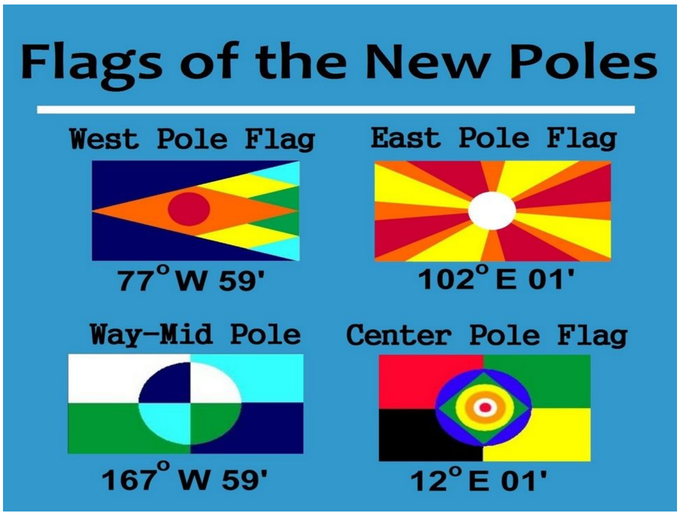
The South Pole's colours too are unofficial. But this paper recommends that they should reflect Antarctica's most famous biped, the penguin. Consequently the colours of the South Pole could be black, white, and orange. Most penguins have orange beaks, often with hints of red. Furthermore, some penguins have yellow feathers, such as the Emperor and Macaroni Penguins.

So what about an East Pole or a West Pole? Can such a point be declared? As organic and natural as the North and South Pole? This section intends to prove that such an argument can be made.

First an argument for a West Pole. Based upon the headings of the compass,[83] it must lie at some unique geographic point on the plane midway between the

83 http://theinstitute.ieee.org/tech-history/technology-history/a-history-of-the-magnetic-compass

North and South Poles, which is on the Equator. Furthermore it should be a natural distinguishing point. South America has such a point in Mt Cayambe, a volcano that forms the highest point on the Equator.[84] Like the North and South Poles, Mt Cayambe is always covered in snow, as any respectable pole should be.[85] Finally, Mt Cayambe is in the middle of the Western Hemisphere.[86]



Proposed flags: further poles

The East Pole can then be established as the diametric opposite of the West Pole. Luckily it is on dry land, on the Indonesian island of Sumatra.[87] There is nothing special about the East Pole, other than it lies in the Eastern Hemisphere, providentially missing the Indian and Pacific Oceans.

Having established a West Pole and an East Pole, this opens the door to a Centre Pole. By mathematical definition it will be the midpoint between the West Pole and the East Pole. Using the normal projection of the Earth as aligned with a compass heading, it is positioned in Gabon and happily not the eastern Atlantic Ocean.[88]

Additionally, since the Earth is a three-dimensional object the Centre Pole must also have an opposite, which will be termed the Way-Mid Pole. The Way-Mid Pole lies in the middle of the Pacific Ocean between the maritime territories of Kiribati and the United States.[89] Its compass heading is the reciprocal of the

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http://www.gisnet.com/notebook/comprose.php ; https://en.wikipedia.org/wiki/Compass_rose

84 http://www.summitpost.org/cayambe/150297 https://en.wikipedia.org/wiki/Cayambe_(volcano)

85 Ibid.

86 Ibid.

87 http://www.latlong.net/; 0 degrees N/S & 77 degrees west.

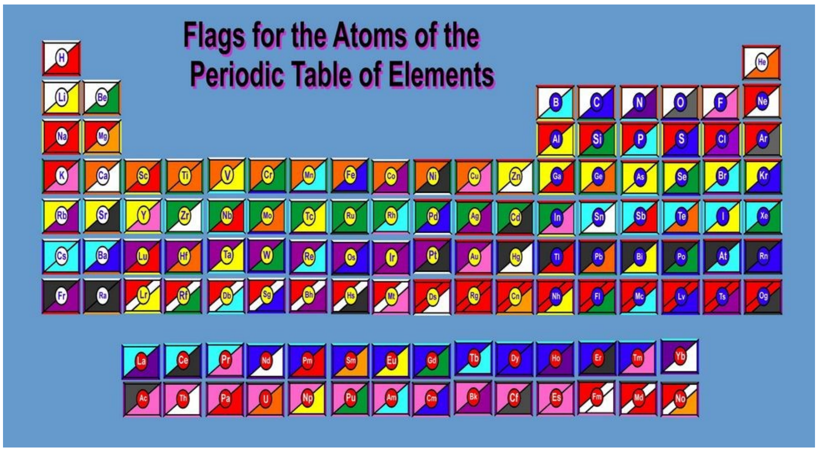
88 Poles determined from a calibration point set with Mt Cayambe, by adding 90 degrees eastward for the Centre Pole or 180 degrees eastward for the East Pole. Finally 180 degrees away from the Centre Pole reveals the Way-Mid Pole. It is best to round up to 78 degrees as Cayambe lies at 77 degrees 59 minutes west.

89 Ibid.

newly established West and East Poles. The term normally used to denote a middle point is midway but since east-west is opposite to the conventional orientation, the term Way-Mid is used convey this. It should also reduce confusion with the island of Midway, which is close to this pole but is an entirely different place.

Colours can be attached to these newly defined poles. For the West Pole a background of navy blue with rainbow stripes and a red centre reflects the beauty of a colourful sunset. For the East Pole a background of yellow with red and orange stripes and a white centre reflects a glorious morning sunrise. For the Centre Pole a background of yellow, black, red, and green with a blue centre was chosen. For the Way-Mid Pole a flag of white with green, cyan, and blue with a centre in the same colours was chosen.

Part L: The scientific elements
L1: Chemistry with a colour metric
In the last part of this paper a final application of the colour metric is presented within the field of chemistry. Since the atoms are ordered and numbered, the colour code metric can easily reflect the periodic properties of the scientific elements.



Proposed flags: periodic table

Certainly nations will come and go, as will their flags. Time and technology are against the momentary way of the here and now. It is certain that the continents will move and national borders will change. Even the heavens will rearrange themselves into new constellations. The brightest stars in the night sky will fade from the limelight of existence, but there is one known objective constant… that of matter, specifically the 118 known scientific elements.[90] It is by the study and understanding of these mysteriously mundane elements that the world has changed and will continue to change into an unrecognisable and unfathomable future. These solid points in space and time deserve a flag of their own, if not only for educational purposes but also to honour their

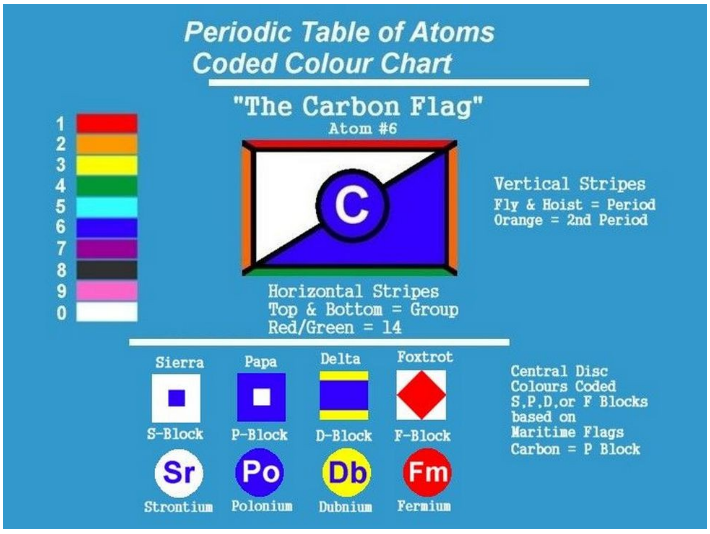
90 http://www.futurity.org/periodic-table-new-elements-1087782-2/
https://en.wikipedia.org/wiki/Periodic_table ;
http://www.dw.com/en/new- elements-complete-seventh-row-of-the-periodic-table/a-36599966
https://sciencenotes.org/printable-periodic-table/

perpetual existence.

The periodic table of elements was completed as recently in 2016 as a harmonious whole.[91] Although more artificial elements are possible, at the current stage the four named corners give an impression that it is complete.

Flags of the scientific elements all maintain a border that reflects its periodic nature. The colours along the fly and hoist code for the period. Right now, there are only seven periods, which coincidentally match Sir Isaac Newton's seven primary colours.[92] The periods are the horizontal divisions of the table, and late last year (2016) the table was completed by verified experiments, with the 'final' elements given 'authorised' names.

Along the top and bottom of each elemental flag are colours that indicate that element's wider group. The central field is a divided field with a sinister bend that reflects an atom's atomic Z number, which is the number of protons in its nucleus. It is the atomic Z number that is the most important, since it gives the atom its chemical properties. Finally in the centre is the standard IUPAC abbreviation, which is coloured according to its appropriate block.



Proposed periodic table flags: colour scheme

The identifying letter of each block matches the colours of International Maritime signal flags: S-block elements follow the blue and white pattern of the Sierra Flag; P-block elements follow the white and blue colours of the Papa Flag, D-block elements follow the blue and yellow colour of the Delta Flag; and F-block elements follow the white and red colours of the Foxtrot Flag[93].

Also note that scientific elements with atomic values above einsteinium, element 99, have a triple division for elements 100 to 118.

Using the colour metric these colourful flags convey five parts of the periodic table in a systematic fashion. The period number by fly and hoist, group number

91 Ibid.

92 Newton, *Opticks.*

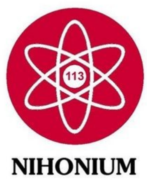
93 Araujo, *History of Signaling.*

by top and bottom, atomic Z number by centrally divided field, elemental abbreviation in the centre, and relevant block by the colour of the central symbol.

L2: Chemistry with art, history and fun

Colour metric flags fit into a logical ordered scientific process by conveying information in a systematic scientific format, but secondary design flags are still very possible, assuming one has a valid point of view. Happily several elements were named after geographic places, allowing a new class of fun, educational scientific element flags that combine history, geography, science, and the arts with the field of vexillology.

Examples demonstrated here are the flags for californium, rhenium, moscovium, tennessine and nihonium. Since these elements were named after geographic places, this was the basis for designing these fun and educational flags.



Proposed periodic table flags: californium, rhenium, moscovium, tennessine and nihonium

Most important for this conference are the flags for strontium and palladium. Strontium was named after Strontian, the Scottish village where in 1790 it was recognised as a scientific element by Adair Crawford and William Cruickshank.[94]

Palladium is named after a place beyond Earth, the asteroid Pallas 2.[95] Since Pallas 2 has no official flag, the flag's design celebrates William Hyde Wollaston, the primary discoverer of the element, who was born in 1766 at East Dereham, Norfolk, England.[96]

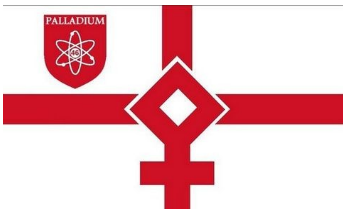
Other elements named after places beyond Earth include: helium, after the Sun

94 Eric R. Scerri, *The Periodic Table, Its Story and Its Significance* (Oxford University Press, 2007); https://en.wikipedia.org/wiki/Strontium

95 Scerri, *Periodic Table*.

96 Ibid.; https://en.wikipedia.org/wiki/William_Hyde_Wollaston

via Helios; plutonium, after Pluto; neptunium, after Neptune; uranium, after Uranus; and cerium, after the dwarf planet Ceres.[97]



Proposed periodic table flags: strontium and palladium

Proposed periodic table flag: cerium

Conclusion

The intention of this paper is to illustrate a vast frontier of unflagged concepts and areas that are ripe for a first flag design. Rather than entering the competitive ring to pit a better flag against an established flag and competing against countless others, a door is opened to a vast pioneering frontier. This paper showcases several fields and opportunities to be the first to lay down a design for an unflagged concept, rather than being the 33rd person to submit a new flag proposal.

Rarely does one remember the 33rd person to do anything, be it in academia or the Olympics. But being first is often noteworthy, which merits a certain degree of respect and social gravitas. For example several unique first-design flags are presented with this paper; most notably the flag for the Prime Meridian. Consequently, in an online search for 'Prime Meridian flag' the design presented in this paper will appear first. For the next few decades this will certainly be the case, until a flag is officially adopted under the name of an official government institution.

Of key importance, this paper presents the world of vexillology with a colour metric. The colour to number metric gives vexillology a simple, ready-to-use scientific tool that can be applied to nearly any discipline: e.g. sciences, business, government, arts, and most notably, geography.

Colours are typically associated with emotions, and their meaning must be explained and defined. But attaching colours to a specific number can be extremely useful. This is not the first time that colours have been attached to numbers; a previous example is the electrical engineering field. However the colour metric presented here gives vexillology a universal tool that adds a degree of professional detachment and can be understood by any culture.

The colour metric is a colourful tool that breathes a certain degree of objectivity

97 Scerri, *Periodic Table*.

into the flag design process. For every geographical sector upon Earth and in the celestial sphere, there is now a flag that conveys meaningful information, with each flag being unique and memorable. Besides numbers, letters can also be processed in a vibrant and meaningful manner with flags, as demonstrated with postal zone flags for the UK and Canada. Thus the range and meaning of flags has been expanded, yet only to the point where it can still be understood, as a consequence of using a colour-coded-to-number flag metric.

But note that the application of this metric can also be bent and modified. It is up to the flag designer to take any liberties that seem appropriate. As a final reminder, the colour metric is not an end-all imperative for new flag designs. Options to create flags based upon some other viewpoint, without this metric, were previously demonstrated and actively encouraged, as shown with the scientific elements.

Flags often convey a passionate stirring of the ego. They are waved in pride or protest. Variously interpreted as offensive to some, yet lovely to others, they often conjure stirring emotions that are undeniable. But many of the flags presented in this paper flutter on a level, less the ego and more as a means to convey information. This is partly due to the colour metric, which relies less on the preferred colours of an ethnic group or political organisation. Rather these flag allot unbiased information reflecting numbers and/or letters. In the end it is hoped that these various flags are able to further connect communities, encourage education, and enhance our recognition with the general public about the relatively small yet ubiquitous field of vexillology.

Author biography

Christopher Maddish is a secondary school teacher of biology and chemistry.

Official national flags are referenced from the seminal Whitney Smith, *Flags through the Ages and across the World* (McGraw-Hill, 1975).

All other flags, official and proposed, are designed by the author.