Stained Glass Sundials

August, 2003

"The Blue Dial"
private collection
Sundial probably by William Price
Dated 1655
Restored 1816

"Ulm-Rathaus Sundial"
East wall sundial, 62 cm x 42.5 cm
Rathaus (City Hall), Ulm Germany
Probably made by Hans Harderbeck, 1540 or 1560
("*Sonnenuhren*" by René R.J. Rohr)

"Cupid and the Four Seasons"
From a print by Titian
Nun Appleton Hall, York, England
By Henry Gyles (1645-1709)
Dated 1670

Did you know that it is possible to make a stained glass window with the design of an accurate functioning sundial on it? I've learned that this news comes as a big surprise to most people outside of the sundialing community. Imagine a typical stained glass window with an attractive design that includes a sundial face. The outside of the window has a metal rod or sheet attached to it and when the sun shines, a shadow is cast onto the sundial face. Since the glass is translucent, you can read the time from inside or outside the building!

This is not a new idea. The first known stained glass sundial dates to 1518. In seventeenth century Europe, when both sundials and stained glass windows were in vogue, a few industrious artisans like Henry Gyles of York and John Oliver combined the art of stained glass making with the science of sundial design and produced wondrous stained glass sundial windows, some of which still exist today.

A few artisans continued to produce stained glass sundials on a small scale until the eighteenth century when interest in them died out, probably due to the advent of reliable mechanical clocks which killed the business of sundial making in general. Very few sundial windows have been built since then. They are so rare that the British Sundial Society has only 39 stained glass sundials in their National Sundial Registry and The North American Sundial Society has none at all registered as of this writing. Most existing examples are found in the old churches, private collections and the museums of Europe, particularly in Great Britain. So you can see why each of the few surviving examples of these beautiful old sundial windows should be cherished and treasured like the rare jewels that they are.

An idea began to simmer after I attended a sundial conference in York England two years ago. Our British Sundial Society toured sundials in York. And on the tour, we saw two beautiful stained glass win-

dow sundials that worked! As a professional designer and maker of sundials and a lover (but not a maker) of stained glass windows, I was very impressed, but I wondered why I had never seen one before. I began to investigate and my research told me that most stained glass experts and artisans have not heard of them either. That was when I decided I needed to do something to encourage the construction of more stained glass windows.

A modern design by Bernhard Franz, Germany
Late 1900's

I thought there must surely be a modern market for new stained glass sundials, if only more people knew about them. They definitely pass the "Wow!" test with most people when they see one. Stained glass artisans could surely use the idea as a new and innovative marketing concept to suggest to their clients. I'm sure many stained glass window makers will be thrilled to find out there is something different that they can do in ancient art of stained or etched glass. The idea is so old it's new again! I can't think of a better way to turn stained glass into educational and functional art. Wouldn't it be great to have one in a school or museum? I also envision them in more churches, businesses and homes as well.

Artwork and Materials: Stained glass sundial makers have a funny old tradition of painting an image of a fly somewhere on the sundial face! In an article he wrote for *The Connoisseur* (*Stained Glass Sundials*, April 1930), historian John A. Knowles says that flies were a common feature of British and Swiss glass in the seventeenth century. There are even examples of spiders and their webs. Knowles shares the following delectable and useful tidbit of information on the ubiquitous flies: "The fly or bee was purely a glass painter's joke; and the amusement consisted in seeing people try to knock it off. Sometimes the legs of the fly were painted on one side of the glass and the body on the other, the difference between the two plane surfaces of the glass giving an extraordinary life-like effect of projection, and one, moreover, very easily produced."

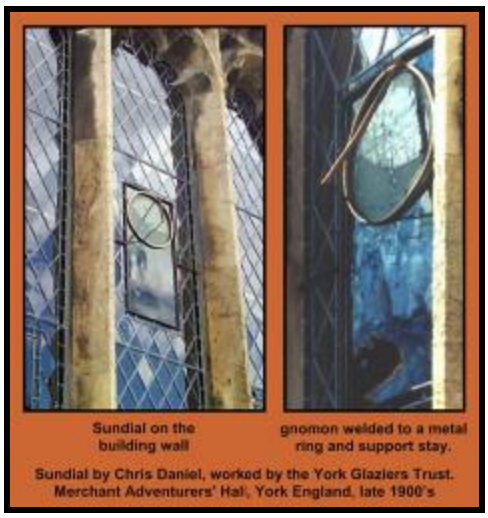
photos courtesy of Andrew James

Other than the "requirement" that they place a fly on the design, glass artisans are free to use pretty much the same techniques and materials that they normally use in their windows. The glass can be stained, etched or painted. The gnomon (the shadow caster) should probably be made from brass, bronze or stainless steel. Aluminum might be preferred if gnomon weight is an issue. On that part of the sundial drawing where you need to see the shadow to tell time, the glass should not be crystal clear or too dark. Otherwise the shadow won't be distinct. The glass of the sundial time scale should be translucent: frosted, or of a light color.

Window Location: Any window that receives sunlight can be used for a sundial, but the best location for a stained glass window sundial is a vertical wall that faces due south in the Northern Hemisphere or due north in the Southern Hemisphere. Obviously, it should receive full or filtered sunlight for most of the day. Another good place is on a horizontal flat roof (like a skylight). Both of these locations are good because the sun shines on the window for most of the daylight hours so they tell time and are functional for the maximum amount of time. On the other hand, you can have a sundial window on an east, west or even a north wall, but these sundials will only work for part of the day. In the tropics, vertical sundial windows will only work for about six months of the year if they are near the equator because the sun is behind the building and doesn't shine on the window.

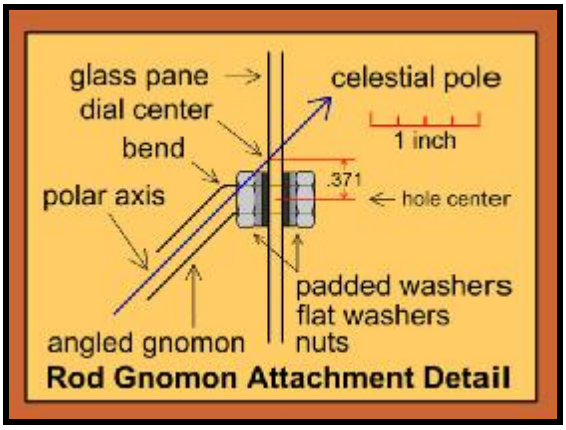
In theory, one can design a sundial for any surface that receives sunlight, even angled, tilted and curved surfaces. But these odd sundials' calculation, construction and installation, particularly the tricky placement of the gnomon (the shadow caster), are more difficult. South wall and flat ceiling sundials are definitely the easiest to design, construct and install. If you want a window for a wall that doesn't face south

or that is not vertical, to avoid errors, I suggest that you work closely with a sundial designer in your local area who would be willing to personally visit the building, take wall measurements and help you with the window and gnomon installation.



Gnomon attachment: There are several ways you can attach the gnomon (the shadow casting metal rod or triangular sheet) to the sundial. You can solder, weld or use an adhesive. These attachment methods are less common in older dial windows, but may be used more often in the future.

The traditional way is to make threads on the end of the metal rod gnomon and bend it in a vise to the exact angle specified in the design plans. Place it through a slightly larger hole cut in the glass or metal structure of the window. If the hole is through glass, to protect the glass, you should use padded washers between the glass and flat metal washers. You might even put a thin padded sleeve around the gnomon so that it is not in contact with the glass at all. Tighten this "sandwich" with nuts on both sides, making sure that the gnomon is pointing in the right direction. Of course, if the glass is too thin, the gnomon could crack the glass, so the other methods of attachment would be preferable. But if the glass is at least 3mm (1/8 inch) thick, it should be ok to bolt the gnomon directly to it if it isn't too heavy.

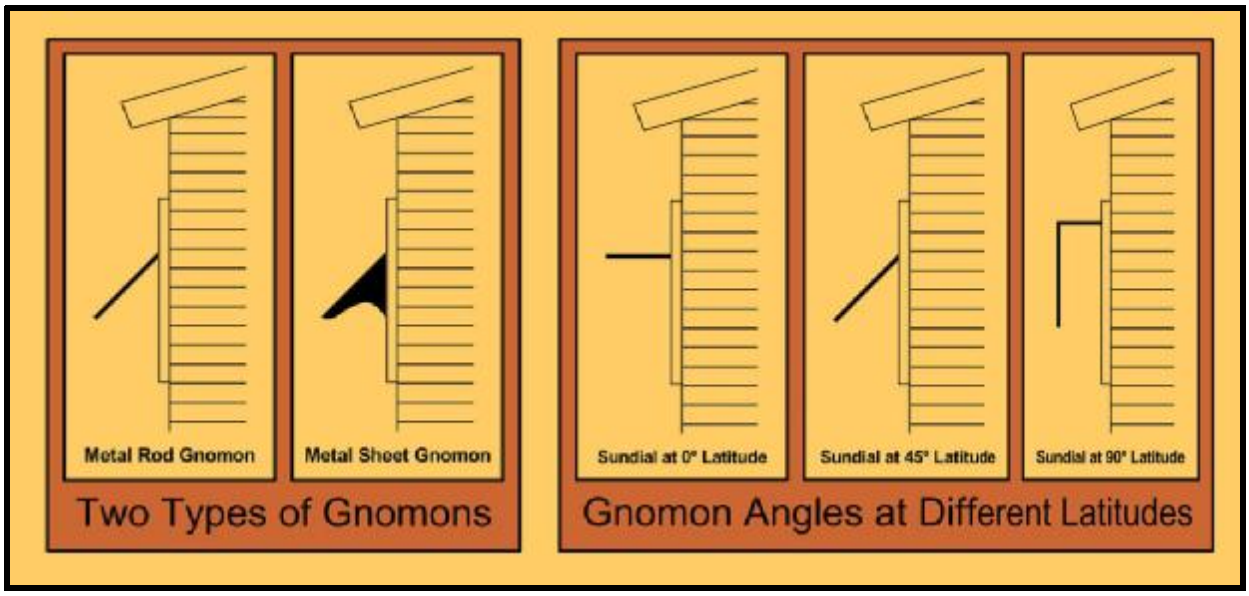


Note that if the gnomon is angled downward, the hole in the glass is slightly **below** the center of the sundial where the hour lines converge. (see Rod Gnomon Attachment Detail drawing). The distance between the hole and the dial center is variable depending on angle of the gnomon and its thickness. In this example, a 45 degree, 1/4 inch thick gnomon makes the distance between the hole and the dial center equal to .371 inches. This distance increases if the gnomon's width increases or if the gnomon is bent more. Therefore, at higher latitudes, the distance from the hole to the dial center increases.

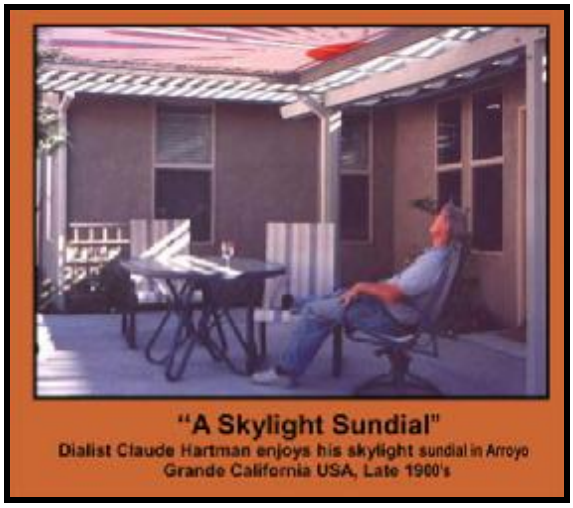
Sometimes, metal support stays are soldered to the outside frame of the window and to the gnomon to give it added support. Also, you can attach the gnomon to the wall of the building directly above the window if it is practical. Your sundial designer will surely help you with the design and placement of the all-important gnomon.

All polar axis gnomons, properly positioned on any sundial, will be parallel to the Earth's axis, and will point to both the North and South Celestial Poles. The North Celestial Pole is located very near the North Star. So, on South wall windows in the Northern Hemisphere, the gnomon will extend outwards and from the dial face and will be angled downwards to the South at mid-latitudes. At the Equator, it would extend horizontally at a right angle to the window face, and at either Pole, it would be parallel to the window, vertical, and spaced away from it.

Most stained glass sundials use the rod gnomons instead of the triangular sheet gnomons because they cast a smaller shadow on the stained glass and don't affect the light and colors passing through the glass as much. They're also easier to make and install. Another type of gnomon not pictured here is a post gnomon. It usually meets the dial face at a 90 degree angle and may have a small sphere or a point at the end. You read the time where the shadow of the post's tip falls on the dial hour lines. Post gnomons can also be used to tell the date on some sundials.



For those who are adventurous, other exotic types of gnomons are possible. The sky's the limit! In this photograph of a horizontal skylight sundial by Claude Hartman USA, the gnomon is simply a gap in a shade cloth placed above the sundial. Note how it uses a bright slash of sunlight to mark the hour.


"A Skylight Sundial"
Dialist Claude Hartman enjoys his skylight sundial in Arroyo Grande California USA, Late 1900's

Sundial Designs: Designing a stained glass sundial window requires collaboration between the client, the glass artisan and the sundial designer. Today's stained glass craftsmen can build a sundial window almost as easily as a typical stained glass window if they have a little technical help with their sundial drawings. Astronomical laws demand that every sundial have a different design depending on its location. Window sundials will function as accurate timepieces only if a qualified sundial designer who understands the math involved provides the artisan with a custom-made design based on the window's specific location using its latitude and longitude. Most sundial designers now use special computer programs to calculate and draw ultra precise sundial designs that are available in printed or digital form. Using this sundial design, the glass artisan can make a window that is just a sundial or he can embellish the sundial design with extra artwork. By looking at photos of existing glass sundials, and using your imagination, you can visualize that many different stained glass sundial designs from traditional to modern are possible.

The glass artisan will have to discuss with the sundial designer details such as the sundial's location, size, shape, time notation (Standard Time or Daylight Saving Time), gnomon type and general design so that he can come up with a drawing that you can work into your window design. You will need drawings of the sundial face and the gnomon. The artisan should have no trouble transforming a drawing of a simple vertical south wall or horizontal sundial into a working sundial window.

If you'd like to find a professional sundial designer to help you with your design, you can locate one via the following websites:

North American Sundial Society Artisans Link: **http://sundials.org/links/**
Sundials on the Internet/Sundial Makers: http://www.sundials.co.uk/sunfair.htm

Education and Publicity: In order to get more of these wonderful things built, it's simply a matter of education and getting the word out. It requires informing the public and the stained glass community that glass sundials are indeed possible, and showing them beautiful existing examples to get them inspired. Therefore, we're publicizing the idea on the internet and in several stained glass publications. With the help of my colleagues in the sundial community, we developed a new educational non-profit website that is a wonderful collection of the only available photographs known to exit of stained and etched glass sundial windows. We are using the website to promote and facilitate communication between stained glass customers, glass artisans and sundial designers. It has links to lists and websites of both sundial designers and stained glass artisans from around the world and it tells the reader how to go about commissioning a sundial window.

It's called:

Stained Glass Sundials of the World: http://advanceassociates.com/Sundials/Stained_Glass

If you make a new glass sundial or find a one that isn't already in the Stained Glass Sundials of the World website photo collection, we'd be happy to include your photos and any information about them you wish to share (building, city, designer, maker, date). Please, if you have any questions email or call me. I'm here to help and serve!

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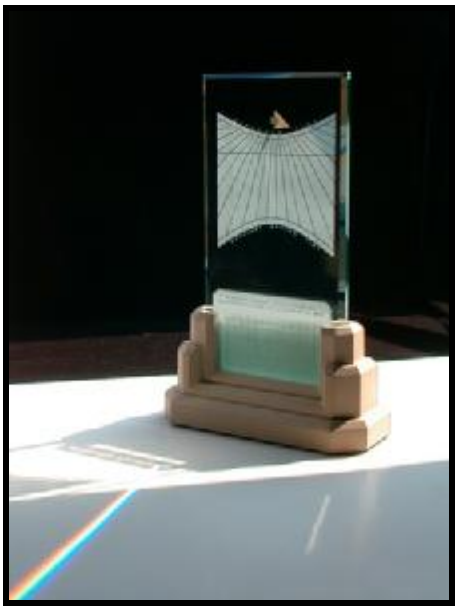

"The Spectra Sundial"
This table top etched glass sundial faces due south and projects a beautiful ever-changing prism beam of light.
By Artisan Industrials Corporation ©2002

"Double Pane Etched Glass Sundial"
There's a west declining sundial in the lower right window pane.
Tolbooth Art Centre, Kirkcudbright, Scotland.
Sundial by David Gulland in honor of George Higgs, 1994