

## Twenty-six Letters — for Our Art

# The Twenty-six Letters in Science Illustration

— Diana Marques

Science illustrators work with images and not with words. The visual communication of science often involves translating text into a more immediate and appealing way to communicate or, at least, to produce images that will go together with text and help to convey the written message. Nevertheless, we use letters, words and text quite frequently, with the purpose of identification (as in writing the common and Latin name of a species), or in complex diagrams, in sketchbooks and book covers, or, even just signing our artwork, since that also implies combining letters with the illustrations.

Letterforms are often neglected. We focus so much on the images that when it comes to the words, they seem to take second place. But how many times has a poorly designed signature at the corner of the page distracted your eyes from a beautiful piece? And how often have you wished that the artist hadn't written that Latin name in colossal letters or even not written anything at all?

Letterforms are undeniably one more element; in fact, not a simple one. As an

element, they have a presence that influences the global piece but they also make their own statement. Acting as a coherent and unified part of the whole piece, letters can create texture, rhythm and contrast in a page but they also communicate graphically through their shapes.

We can certainly appreciate Norm Frisch's knowledge of good letterform and the time he spent carefully building the letters of the GNSI logo (*Fig. 1*). Norm mentioned how he tried to balance the weight of the stroke with the negative area around each letter and then to balance the letter spacing across all letters. But his major concern was readability versus decoration of the letters, especially the intertwining of letters G and S.

Norm's concern resonates with the words of a contemporary calligrapher, Julian Waters, who says, "Calligraphy does not necessarily have to be beautiful in order to be of quality. A better test is whether it is expressively appropriate and whether it communicates well."

Notice how the statement refers to calligraphy, as it is traditionally thought of as the art of beautiful handwriting. But lets

give it a broader sense: whether we are talking about calligraphy, lettering or typography (whose boundaries can get quite blurred), when we narrow it down, we are essentially talking about letterforms that can eventually be part of our artwork. And, in science illustration we won't likely make use of letters as an art form in itself but always with the purpose of aiding communication

or enhancing the aesthetic qualities of our work, with legibility in mind. Thus, a balance has to be achieved between readability and aesthetics the same way that in science illustration we pursue the balance between scientific accuracy and aesthetics.

An immediate and understandable thought would be: "Why give so much consideration to letterforms if, with a click of the mouse, I can have an endless list of fonts generated instantaneously for me?" Well, it is a good question. But to those of us who have tried to use the usual fonts just as they come with the usual software, frustration might have been the result. It is like incorporating a "one-size-fits-all" or "all-purpose" font in our very own original art.

Usually such and such font would be perfect except for... and that is where some awareness of letterforms and how to combine them with our artwork grants us an educated perspective. Whether we're using a pencil, a pen nib or a computer mouse, letters can be modified or created from scratch to better serve us.

A step towards the understanding of good letterforms comes from knowing their origins and how they evolved to their current appearance.

Before there was an alphabet there were systems of symbols. Common sense suggests that many written symbols originated from pictures that represented everyday life: one drawing representing a cow, another a tree, etc.

In theory, one would need thousands of signs to communicate, in a rather impractical way, probably even beyond human capacity. Besides, at what point in a scale of generalization and association of ideas does the meaning of a symbol fail? A standing male stick figure could mean anything from one individual to the totality of men; it could also symbolize stand, wait, alone, lonely or even men's rest room! (*Fig. 2*) And then, there are the cultural difficulties: the cow is associated with milk and meat in the west but in India has a hump, is holy to Hindus and may not be slaughtered.

Even though some people like to imagine that "hieroglyphs" are striking back—beside highways, at airports, on maps, in weather forecasts, on clothes labels, on computer screens...— and that an entire



Fig.1 What would the GNSI logo look like if it hadn't been designed with some ground knowledge in good letterform?

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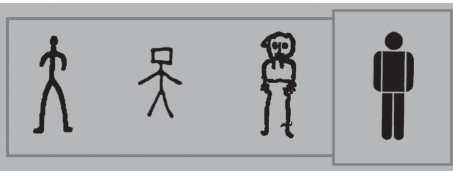


Fig. 2 Where does the meaning of a symbol fail? These are several representations of the human figure throughout time and for any of these symbols one can wonder: is it just one individual being represented or the totality of men? Is it man standing, waiting, alone? Is it the men's rest room?! Source: Robinson, A. *The story of writing*. Thames & Hudson, 1995

written language independent of any spoken languages of the world could be invented, the truth is: writing and reading are intimately bound to speech. And that is why the radical idea that a pictographic symbol could be used for its phonetic value was essential to the development of full writing. For example, in English, the picture of an *eye* could stand for the pronoun *I*, and the picture of *rain* for the word *reign*. Similarly, a picture of a *bee* and a *leaf* together might represent the word *belief*.

It is now accepted that writing began as a method of recording the payment of taxes! Farmers living on the banks of the Nile had to give up a share of their crops as payment for the water needed to fill their irrigation ditches. A picture of a basket for measuring grain together with strokes indicating the number of measures paid would be scratched in the farmer's house walls, serving as record of payment and receipt.

Egyptians, and before them Sumerians and their cuneiform writing, are credited for creating the first functional phonetic systems of writing. These were organized systems, involving the use of hundreds of symbols, capable of clearly recording what the writer was thinking and feeling. It was no longer a single thought being transmitted but speech and language being expressed. Although it meant that one now needed to know the language of the person who had written it in order to understand it, at least the sign was capable of capturing whatever the spoken language conveyed.

But notice that their writing didn't use an alphabet. In fact, an alphabet consists of a limited number of signs, usually between 20 and 30, expressing the basic sounds of

the language. So, how does one go from using hundreds of signs (as is still the case in Chinese and Japanese cultures) to mastering only a handful of them?

The Egyptian hieroglyphs began to shed some of its images, resulting in the first attempt at an alphabet, known as proto-Sinaitic, which eventually developed in Phoenician hands, becoming the first alphabet in history. Quite recently archeologists found the oldest known inscribed stone bearing the 22 symbols of the Hebrew alphabet, still in the transition stage from its Phoenician roots<sup>1</sup>, proving once more how Hebrew (as well as Arabic and other scripts of Central Asia) evolved from the early alphabet.

The other evolutionary line of the Phoenician alphabet led to Greek and its descendents (Latin and all the Western alphabets). There was naturally some distortion from the Phoenician alphabet into the Greek, especially because the letter names would not have rolled naturally off the Greek tongue. So *aleph*, the first letter of the Phoenician alphabet—meaning ox, representing strength and energy, hence being put in front of all other letters to become the inaugural letter—was turned into *alpha* by the Greeks. *Beth*, meaning house, became *beta*. *Gimmel*, meaning either camel or throwing stick, turned into *gamma*. *Daleth*, meaning door or women's breast, turned into *delta*. And so on.

The change of the name was accompanied by the change of the shape of the letters (Fig. 3). From a biologist/science

illustrator point of view it is fascinating to realize that most of the letterforms we use today actually started out as organic shapes; but the simplification and abstraction of form through time left us with nothing but geometrical skeletons, simple combinations of line directions and lengths. Therefore, building letters is like attaching muscles to bones: we have a formal basic shape that we use as a starting point and can change as we please, knowing however that the further away we go from it, the more difficult it will be to read the shape as the corresponding letter. Our alphabet is in fact no more than a code and there is a limit to how far we can change the elements of the code before they are no longer understood by others.

Probably the letters that are truest to their skeleton are the Roman capitals, the hand script used in Roman inscriptions 2000 years ago, and which we still use today. The Romans adapted and modified the Greek alphabet to create their own, spread their culture and language along with their empire, and even in countries where Latin didn't replace the native languages, the Roman alphabet was adopted. The proliferation of European colonies later in history resulted in the broad use of the Roman alphabet, with the exception of a few cultures.

The story and meaning behind this handful of letters that we take for granted every day, every time the pen touches the paper and the finger the keyboard, are the evidence that the alphabet is the

EGYPTIAN	PHOENICIAN	GREEK	LATIN
	aleph ox	A alpha	A
	beth house	B beta	B
	gimmel camel	Г gamma	C
	daleth door	Δ delta	D

Fig. 3 Evolution of some letterforms from their Egyptian origins to their current shape. Find the complete table online at [www.dianamarques.com/PresentationGNSI-table.htm](http://www.dianamarques.com/PresentationGNSI-table.htm) (hard copies can be requested at +351213855697 [in Portugal] or through GNSI by contacting the newsletter editor, Barbara Gleason.) Adapted from: Robinson, A. *The story of writing*. Thames & Hudson, 1995; Davies, W.V. *Egyptian hieroglyphs*. The British Museum Press, 1987 and Ouaknin, M. *Mysteries of the alphabet*. Abbeville Press Publishers, 1999.

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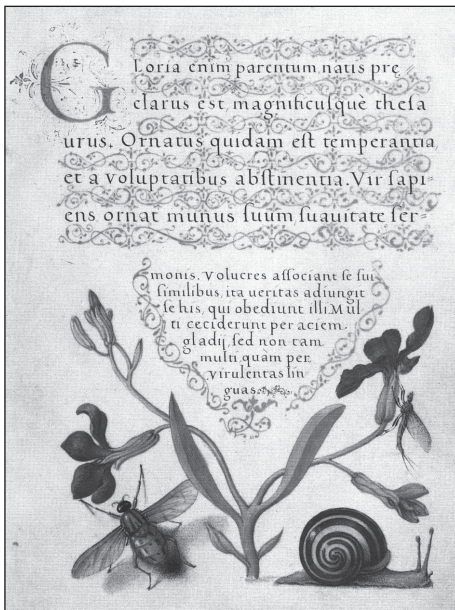


Fig.4 – *Mira calligraphiae monumenta* is probably one of the best examples of the combination of traditional hand scripts and illuminations. Source: *Nature Illuminated*. The J. Paul Getty Museum, 1997

most important system of symbols ever devised by Man.

The graphic dimension of these symbols had its first peak during Middle Ages and Renaissance. The exploration of letterforms and their combination with illustration is translated in centuries of hand-produced books requiring significant human and material resources. The scribe had to plan for the illumination that followed the writing of the text; artists were paid on a scale that rated the sizes of initials, the intricacy of their details, and the scope of the illuminations, and these grew in stages, from simple sketches through fully executed drawings to final infilling of colors and precious metals.

*Mira Calligraphiae Monumenta*, or the *Model Book of Calligraphy*, is one of the best examples of the relation between science illustration and letterforms from the European Renaissance (Fig.4). Commissioned to do the book in 1561, the calligrapher Georg Bocskay displayed his own writing skill and created a work of great visual splendor that included a vast selection of historic and contemporary scripts. More than 15 years after Bocskay's death, the illuminator Joris Hoefnagel was called to illustrate the calligrapher's work and with incredible scientific accuracy he depicted flowers,

fruits and small animals, combining them with the preexisting calligraphy in the book. Without ever meeting each other, both men mastered their trade and the result is a visual debate arguing the superiority of one art form over another.

In the production of manuscripts it was quite normal for the writing and illumination to be carried out by different people and for the writing to precede the illuminations. Up until this point, the structure thus created favored the written words, which remained the focal point, and the illuminations were most often developed in a border around the text and had to accommodate themselves to the writing. But what Hoefnagel set out to do was demystify the text by placing his imagery directly on the surface bearing the text, claiming equality and even sometimes invading the central space of the writing with his images.

But Hoefnagel's accomplishment was somehow lost with the passage of time. Even when *Mira Calligraphiae Monumenta* was produced, printed books had almost replaced manuscripts—Gutenberg in Germany had made his movable type resemble handwriting as much as possible, retaining the manuscript look, but saving the time and costs that printing allowed. And even though the earlier books still maintained the hand drawn initials in color, eventually that was lost, too, and images evolved into woodcuts, later into engravings, living on separate plates.

Over the course of the 20th century, designers woke up to the idea that they were no longer restricted to hand lettering or available fonts and could develop or create their own, sometimes without any real understanding of good letterform, and then software that could modify and create lettering like Fontographer™ came onto the market. These changes, along with digital printing, combined to turn books into what they look like today, with almost no restrictions regarding image and text placement and interaction.

So, where does science illustration fit into all of this? We certainly don't expect to see modified fonts or handwriting in scientific journals (although even in these there are sometimes critical choices that have to be made concerning legends and captions, when publisher's guidelines

are less than detailed). But we all know that this is far from being the only way to communicate science visually.

Looking at the work of some present-day artists who have used letterforms in their illustrations and analyzing the effect, provides some idea of how that link can be established and allows us to determine if it is something we want to pursue in our work. At least it educates our eyes in case the need to include words becomes important to our images.

Marie Angel has had a long career as a calligrapher and illustrator. In her book *Painting for Calligraphers*, she writes, "If letterforms are to be incorporated as part of the design, I always arrange these first; I think of them as a strong framework on which to build up my composition. The letters are most often only sketched in skeleton form and are not painted at first, but usually left until last so that the color of the letters may exactly complement or contrast with the design." In *An animated alphabet*, (Fig.5) she prefers Roman capitals, the script regarded as most true to its letter skeletons, since most of the letterforms are being covered with the illustration and a good and readable underlying structure has to be assured.

Dugald Stermer is a graphic artist who very often includes letterforms in his il-

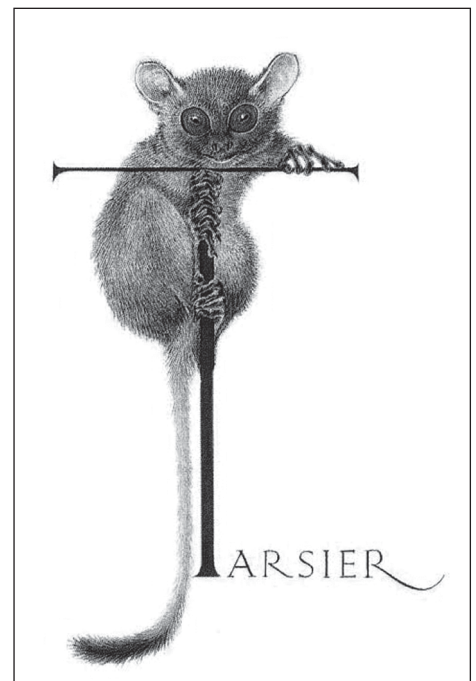


Fig.5 – T is for tarsier. Source: Angel, M. *An animated alphabet*. David R. Godine Publishers, 1996

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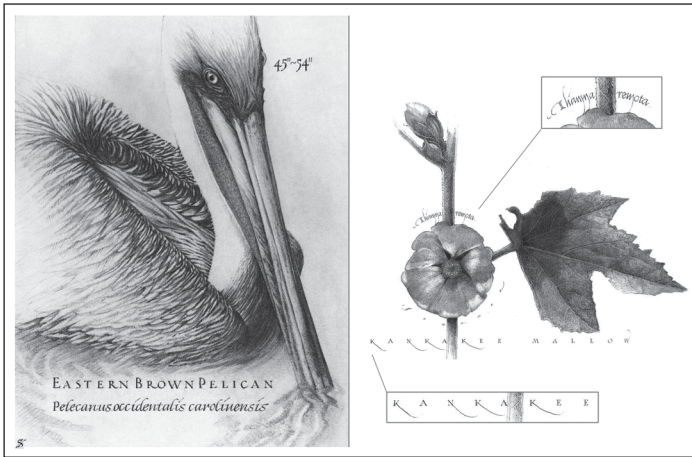


Fig.6 – Dugald Stermer very often includes letterforms in his illustration work. Source: (left) Stermer, D. *Vanishing creatures, a series of portraits*. Jain Publishers Co., 1980 and (right) Stermer, D. *Vanishing flora, endangered plants around the world*. Harry & Abrams, 1995 (with insets of some enlarged words)



Fig.7 – The work of Trudy Nicholson translates how the presence of letterforms has influence over the visual message and how letterforms can communicate graphically through their shapes.

illustration work. His images of zoological and botanical subjects contain written information regarding the common and Latin name of the species and, in the artist's earlier work, also some numerical data such as the animal's weight or wing span are present (Fig.6). The evolution of Dugald's style is noticeable when one compares his books published 15 years apart: the page that was completely covered with subject and background and where large letters overlapped the image, later became a primarily white page with a spot subject and satellite small letterforms related to the image by proximity and wrapping. Even though still informative, the writing was clearly relegated to second place and adopted a much more decorative purpose. This is also evident in the letterforms themselves: they become more flourished, include more acute angles, and the letter spacing is taken to extremes, despite Roman capitals and italics being always the scripts of choice. Thus, we see Dugald's work approaching the use of letters as embellishing elements, more than functional elements.

Which style is visually more pleasing or better serves its purpose, is an individual opinion but the mental process that takes place is a step toward the study of letterforms and how they can be included in images.

As said before, the presence of letterforms

has influence over the visual message that is being sent but also letterforms communicate graphically through their shapes. And that could not be clearer in the work of Trudy Nicholson (Fig.7). The two pieces included here transmit different feelings through the differences in the composition, poems and letterforms: on the one hand we learn about the silent mockingbird (Fig.6, right) reading words written in foundational script, a very regular, round and solid script—in this very soothing piece the chosen script is in accordance with the overall character and allows a very immediate legibility. On the other hand, together with the June beetle (Fig.6, left) we find a very particular style of italic script being used, very flourished and dynamic, mimicking the twists of the vegetation on the background—a very lively composition is created forcing our eyes to move quickly though the piece, but at the expense of legibility. Even Trudy's signature was modified to better suit the nature of each piece and it is the care put into this kind of detail that contributes to a successful illustration.

It is our responsibility (and aspiration) to communicate science in the most accurate and appealing way we can achieve. Letterforms can in some cases make an important contribution if knowingly used—we just need to balance the way it looks with the way it is interpreted.

Diana Marques completed a biology degree and several drawing and science illustration certificate programs in Portugal before graduating from the Science Illustration Program in Santa Cruz, CA, in 2004. She did practical training at the Queensland Museum in Brisbane (Australia) and at the American Museum of Natural History in New York and is currently doing free-lance work in Portugal and in the US. Contact: [www.dianamarques.com](http://www.dianamarques.com); [dianamarques@netc.pt](mailto:dianamarques@netc.pt)

This article is a modified and expanded version of a presentation developed for the 2005 GNSI Conference in Bar Harbor, Maine. Its presentation format is available at [www.dianamarques.com/Presentation-GNSI.htm](http://www.dianamarques.com/Presentation-GNSI.htm) and the list of books consulted at [www.dianamarques.com/Presentation-GNSI-books.htm](http://www.dianamarques.com/Presentation-GNSI-books.htm) (Hard copies of the book list can be requested at +351 21 3855697 or through the GNSI newsletter editor, Barbara Gleason.)

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<sup>1</sup> For more information read *A Is for Ancient—Describing an Alphabet Found Near Jerusalem* by John Noble Wilford in the international section of the New York Times of November 9, 2005 (available online at [www.nytimes.com](http://www.nytimes.com)).