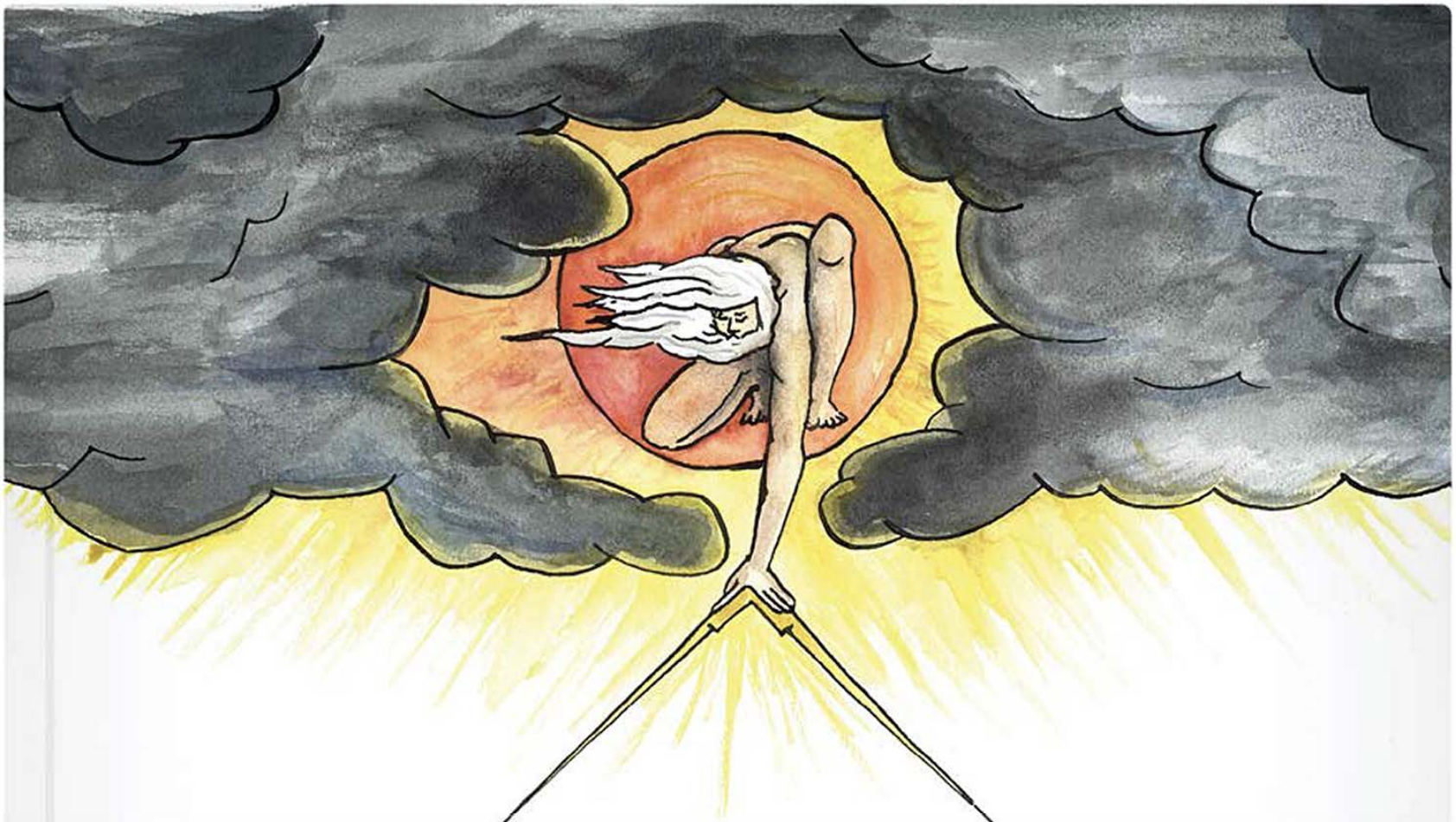
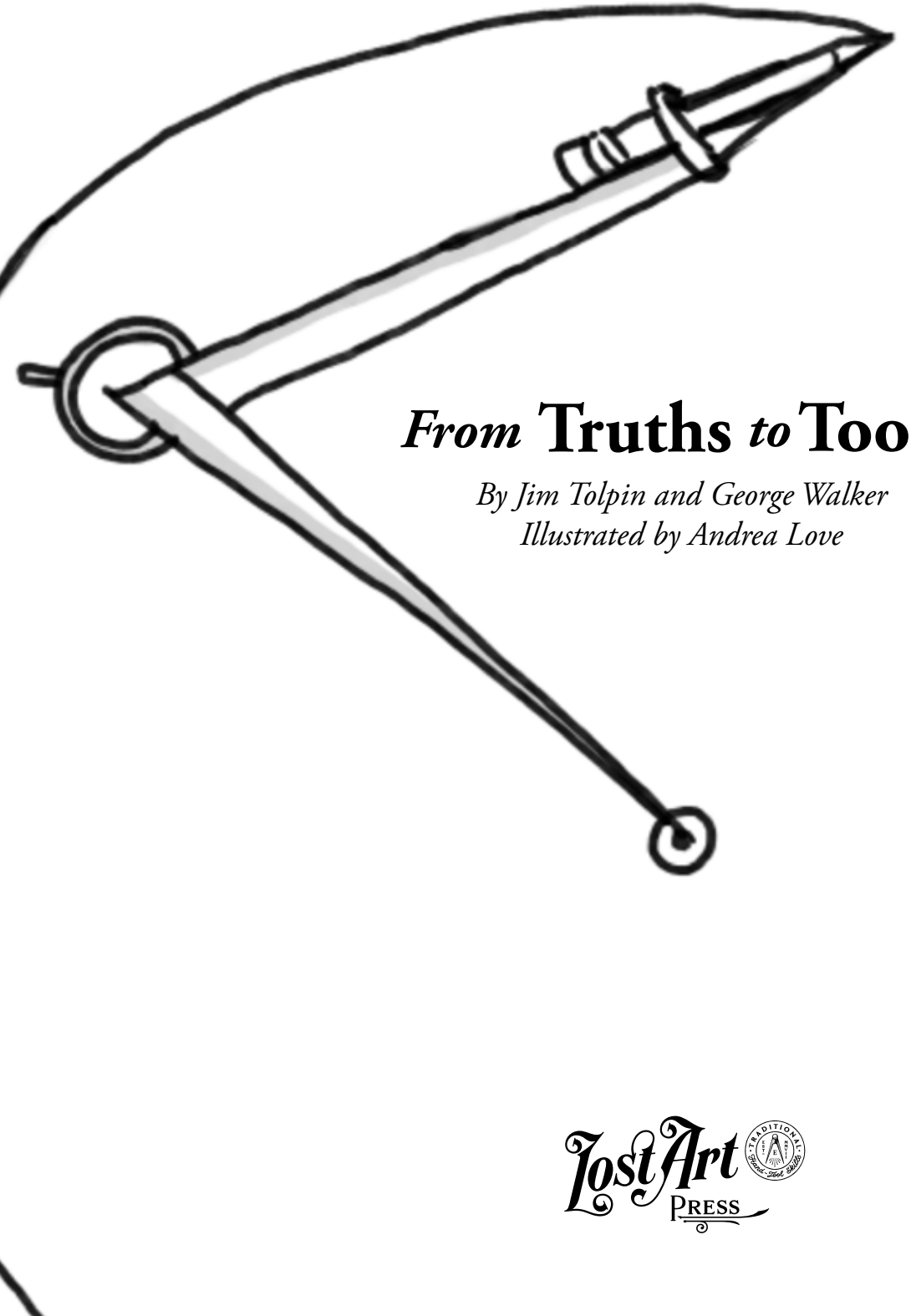


From TRUTHS to TOOLS

By Jim Tolpin and George Walker
Illustrated by Andrea Love

From Truths *to* Tools



From Truths *to* Tools

By Jim Tolpin and George Walker
Illustrated by Andrea Love

Lost Art Press

First published by Lost Art Press LLC in 2017
26 Greenbriar Ave., Fort Mitchell, KY 41017, USA
Web: http://lostartpress.com

Title: From Truths to Tools
Authors: Jim Tolpin and George Walker
Illustrator: Andrea Love
Editor: Christopher Schwarz
Copy editor: Kara Gebhart Uhl
Book Production & Design: Meghan Bates
Cover: Andrea Love
Distribution: John Hoffman

Copyright © 2017 by Jim Tolpin and George Walker

ISBN: 978-0-9978702-5-1

ALL RIGHTS RESERVED
No part of this book may be reproduced in any form or by any electronic or mechanical means including information storage and retrieval systems without permission in writing from the publisher, except by a reviewer, who may quote brief passages in a review.

This book was printed and bound in the United States by:
Signature Book Printing, Inc.
8041 Cessna Ave.
Gaithersburg, MD 20879
http://signature-book.com

Table of Contents

Introduction *1*

The Awl *8*
Dividers *13*
Rulers *16*
Story Sticks *21*
Compass *27*
Spiling Batten *34*
String Line *40*
Straightedge *45*
Bending Battens *47*
Marking Implements *49*
Plane Generators *58*
Gauges *69*
Squares *95*
'Smart' Square *108*
Plumb Line *117*
Libella *122*
Center Finder *128*
Sector *136*
Proportional Dividers *141*
Scale of Chords *145*
Protractor *149*
Large-Scale Layout Tools *155*
The Triplet *157*
Carpenter's Ten-Foot Pole *160*
Thirteen-Knot Cord *164*
Cord of Polygons *168*
Groma and Merchet *172*
Cords of Magnitude and Angle *175*
Chorobate *179*
Cross Staff *182*
Logger's Felling Gauge *186*

Appendix *191*
Epilogue *193*

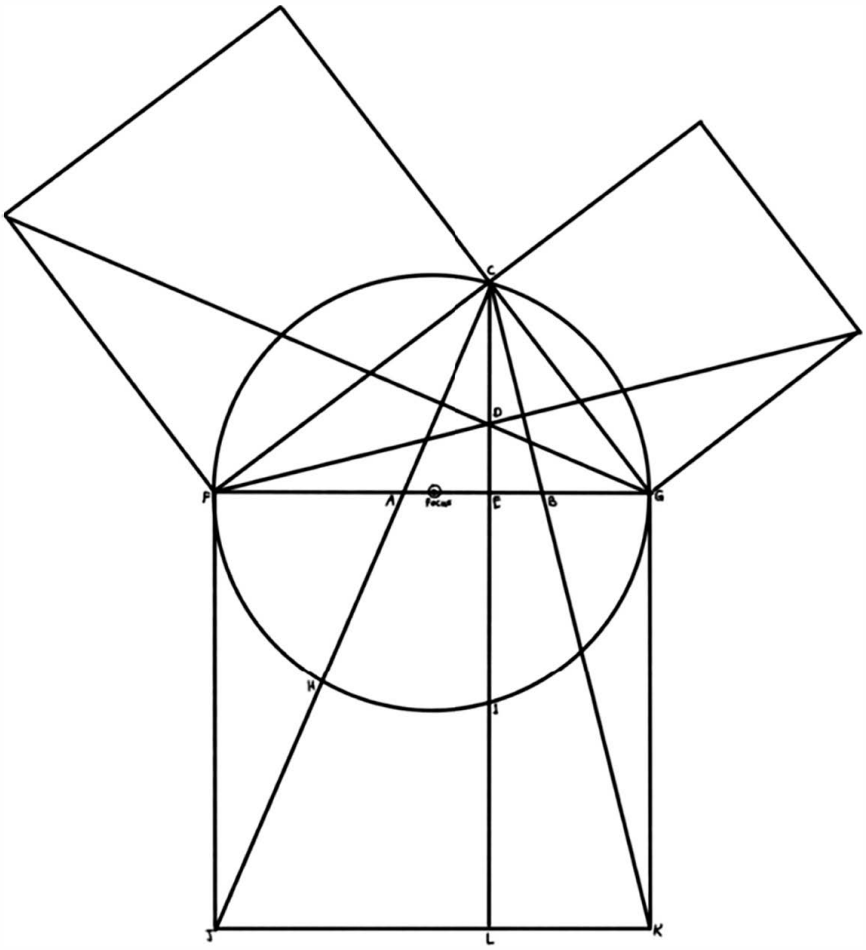
Author's Note:

We occasionally use words from Greek or Latin in the description of some of the principles and operations of geometry. We discovered (as you no doubt will also) that the ancient roots of geometric terms hint to- or outright reveal- the reality underlying their immutable truths.

The root words are indicated with *italics*.

"**Alethia**" - the revealing, the uncovering, the bringing of what was previously hidden into the open - the **Truth**.

Translation from ancient Greek by Martin Heidegger



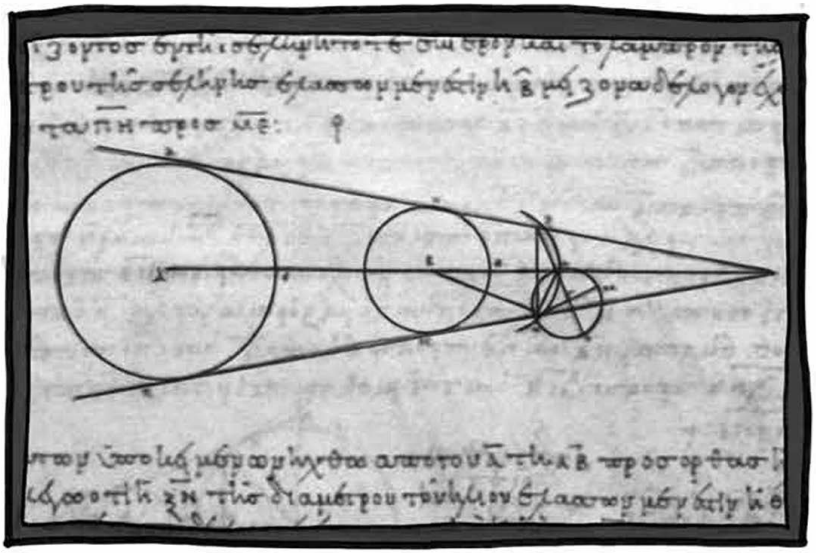
Embedded in this geometric construction from antiquity is all the information an artisan needs to create a full kit of layout tools. When you finish the book, come back and the inherent truths of parallelism, like angles, right angles, triangular proportionality and a 3-4-5 triplet generated from a hidden hexagon will be revealed.

"We invented nothing. We discovered nothing. We are only rediscovering a tradition that was locked away inside an old forgotten box."

-Marco Sermarini

Using little more than tools fashioned from sticks, strings and rocks, the ancient geometers unlocked the the realities of shape hidden right before their eyes.

Detail of Euclid from "School of Athens" by Raphael (1511).



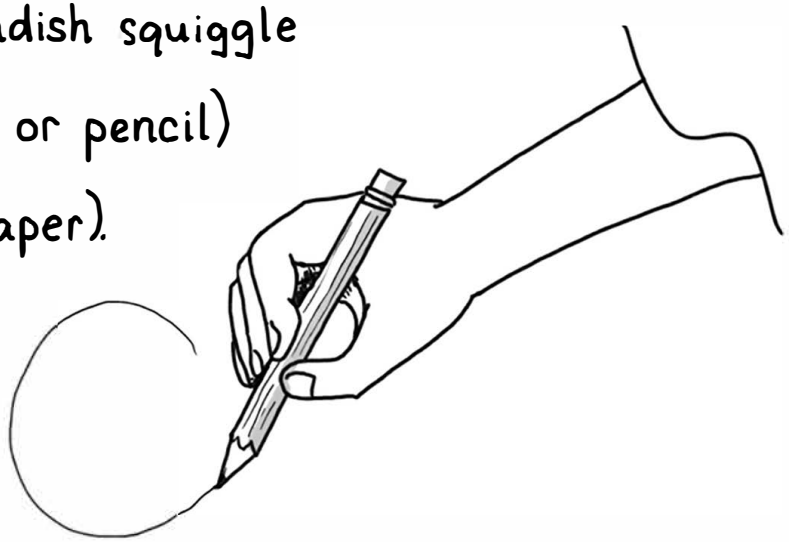
Aristarchus's 3rd-century BC calculations on the relative sizes of, from left, the sun, Earth and moon, from a 10th-century CE Greek copy.

Having discovered the immutable truths of "*geometron*" (**earth measurement**), they were able to use these tools to accurately calculate not only distances and shapes of objects on the earth's surface, but also the circumference and diameter of the earth itself, as well as the distance to the moon within a few thousand miles.

To begin our own exploration of the truths behind our tools, we need to begin here with this guy...

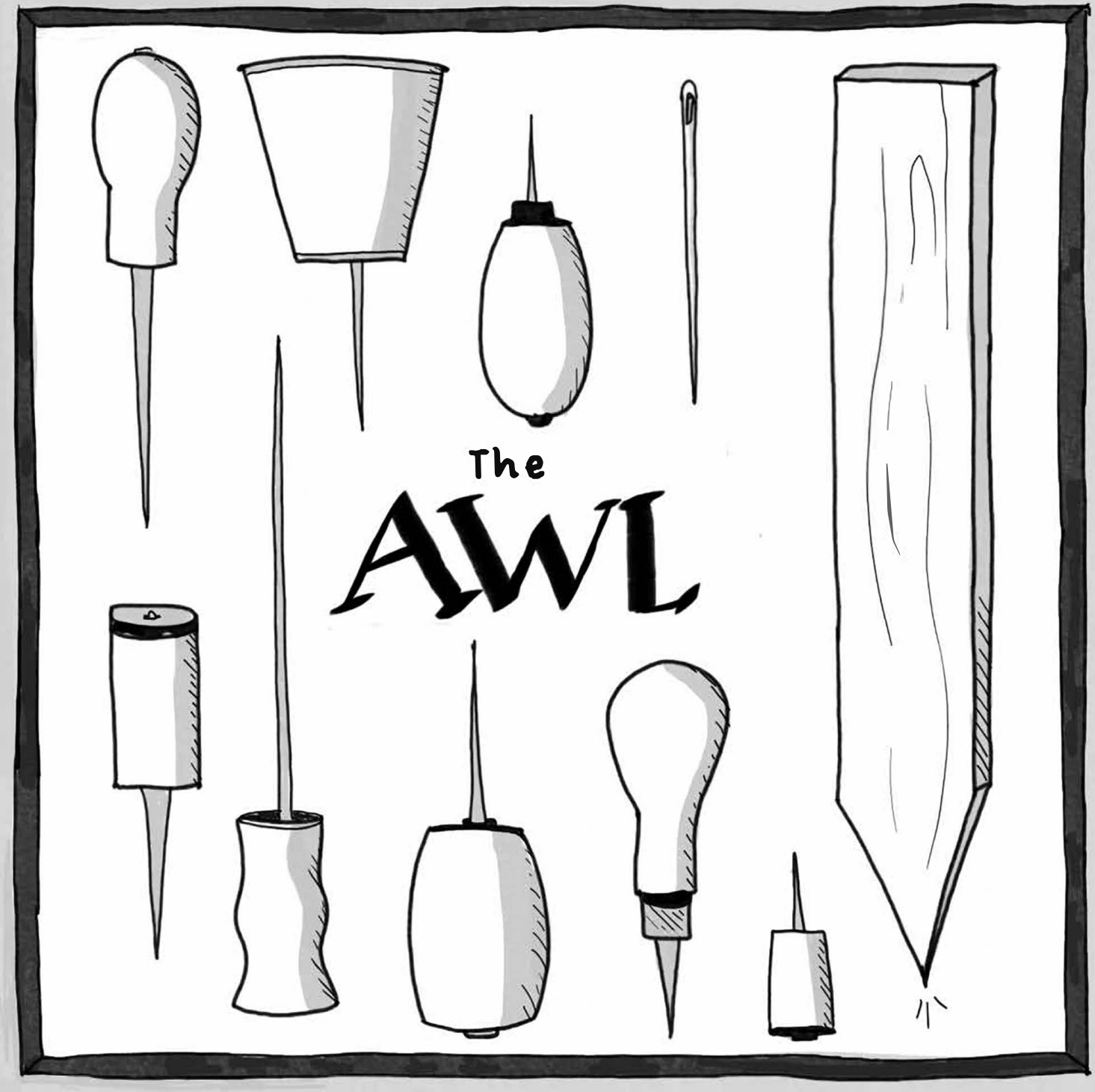
Zephyr

. . . by making a roundish squiggle with a "*peniculus*" (brush or pencil) on a piece of "*papyrus*" (paper).

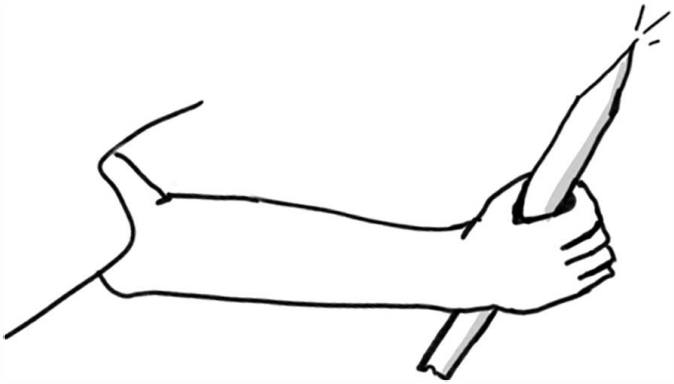


Don't confuse this squiggle with the number "*cipher*" (zero) of the bean counters of the Middle Ages. Instead it represents "Zephyr" in the symbology of ancient Greece. This mythical god was the source of the gentle western winds of spring that brought life and light to the islands of the Ionian Sea - the home of the geometers.

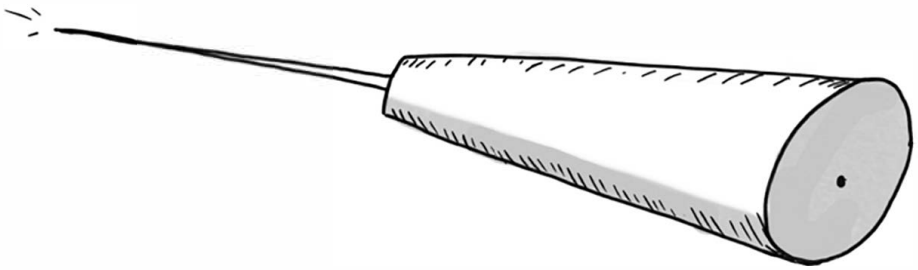
The round symbol of Zephyr marks the source from which everything (geometrically speaking) will, literally spring. It is, the "*natio ec locus*" (**the birth of location**).


The
AWL

Now let's grab a stick and sharpen one end to a fine "*punctum*" (point). The sharper the point, the more precise the geometry we'll be able to produce.

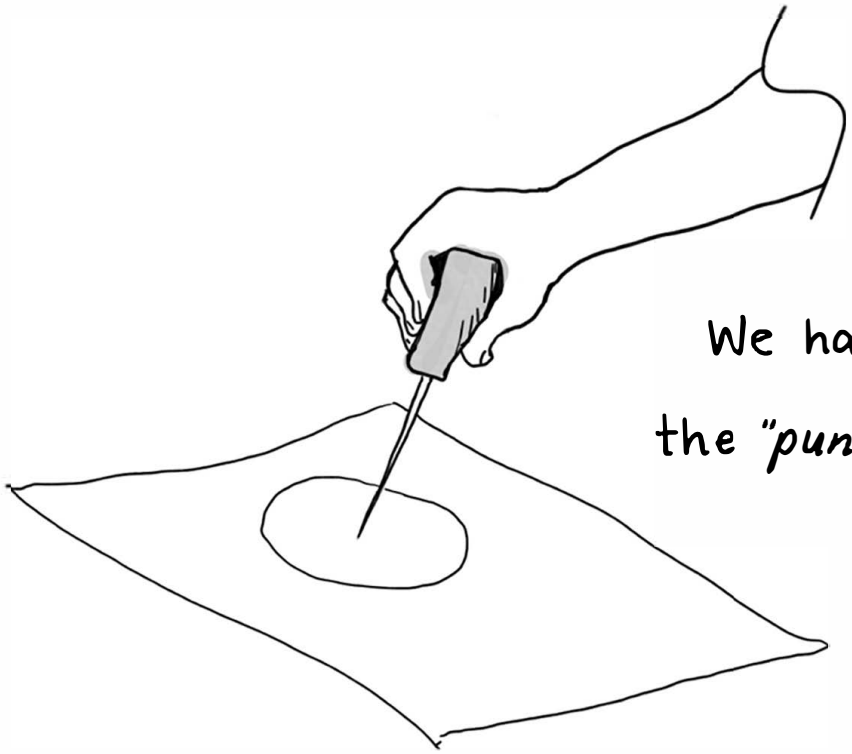


Later we'll refine this tool with a thin metal point and call our creation a **marking awl** (from the early Germanic word for "pierce").



We now have in hand our first hand tool of geometry!

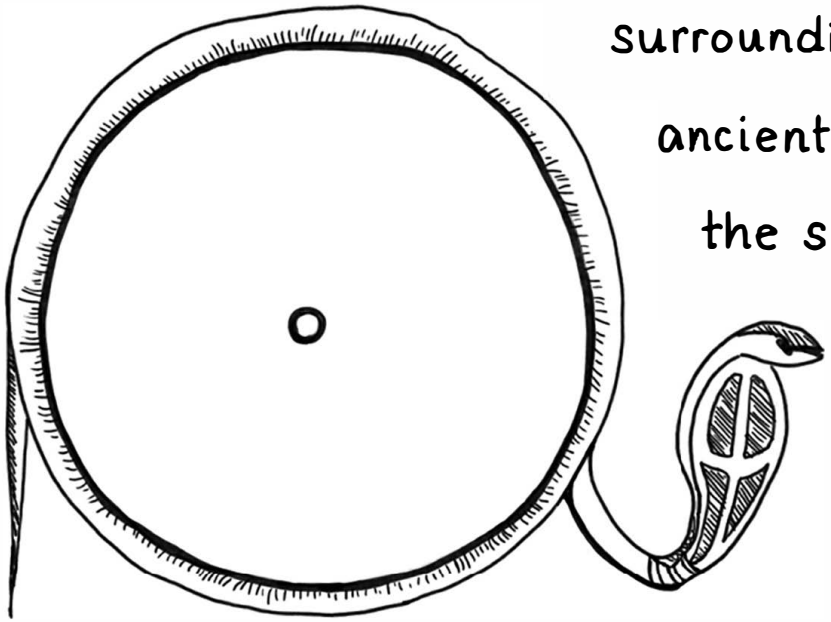
We take the awl to our location and construct our first geometric expression inside the squiggle by piercing the paper. The point of our awl should be sharp enough to pierce paper or wood with as tiny a hole as possible.



We have thus given birth to the "*punctum*" (point).

While the geometric point technically has no dimension, in truth we can't create anything- shapes, forms or layouts- without it. (There would be no point.)

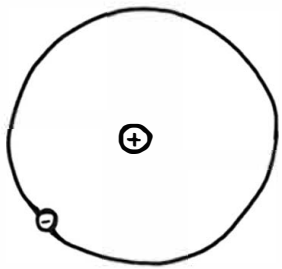
Just so you know, a round shape surrounding a point was the ancient Egyptian symbol for the sun god "Ra."



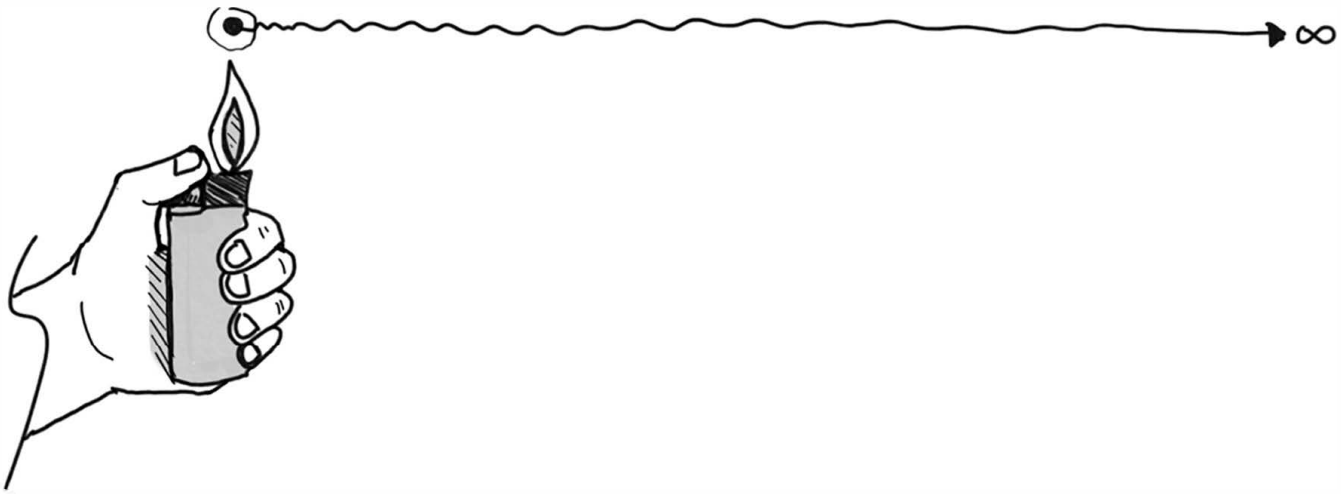
Coincidentally (?) this is also the modern representation of the hydrogen atom, the most abundant element in the sun, not to mention the universe. Everything is made from it.

hydrogen atom →

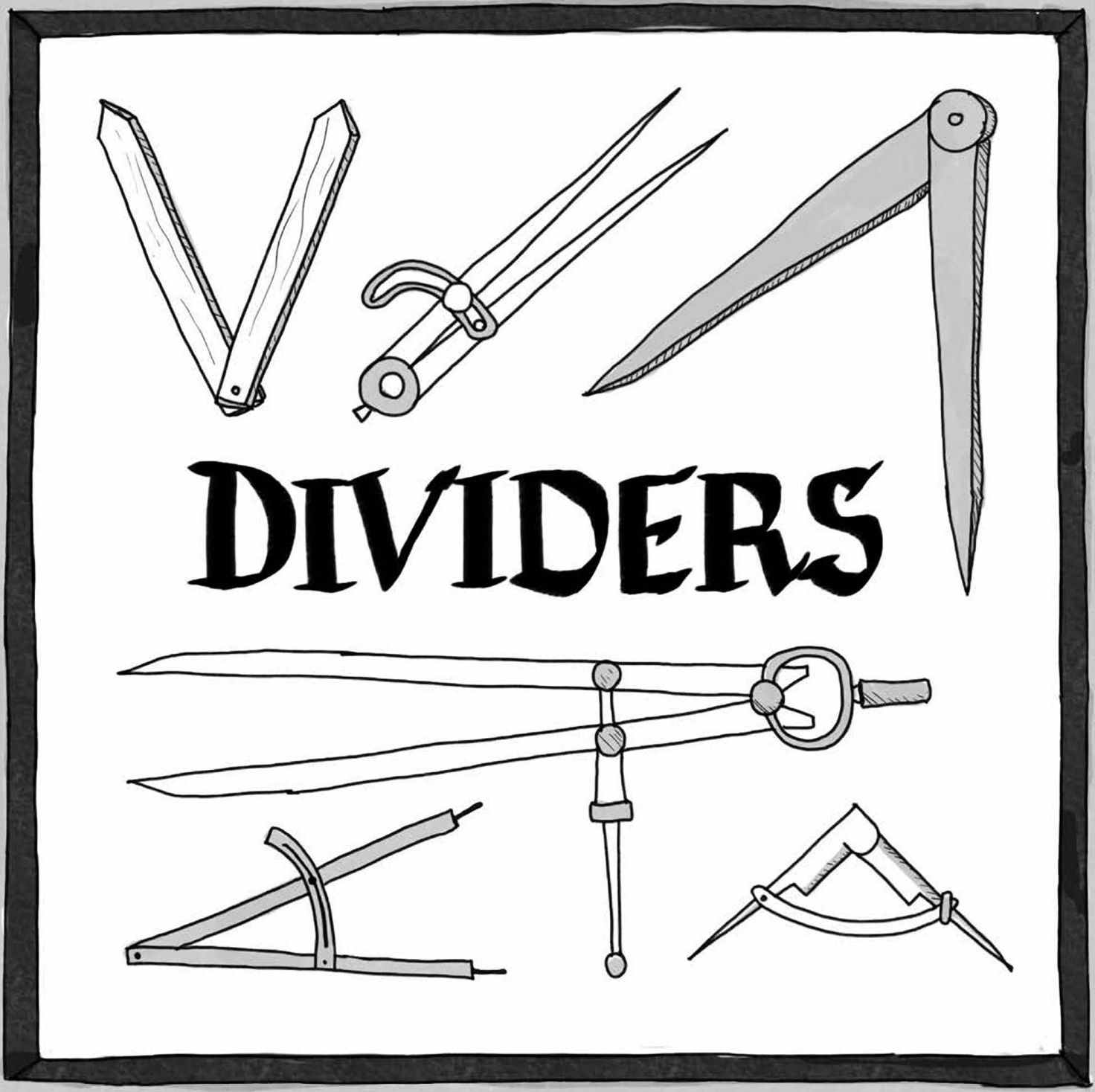
(70% of the sun's mass)



Taking a cue from the sky god, let's *"punctum ad focus"* (set the point on fire).



With the point ignited, a ray is emitted to produce the birth of *"directio"* (**direction**). Our ray will gladly go that way forever unless we can come up with some sort of limiting factor.

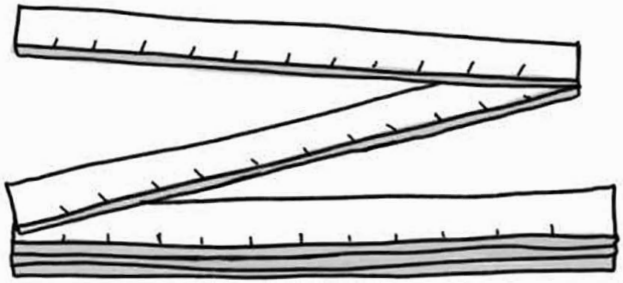

DIVIDERS

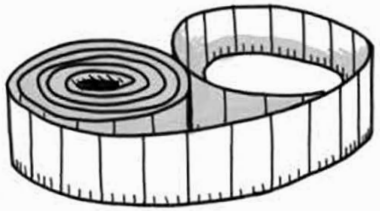
To establish that limit, we take a pair of similar-sized sticks, sharpen one end of each to a point and hinge them together so we can "*dividere illis aparte*" (divide them apart).

We'll call our new tool a pair of **dividers**. Like the awl, we want the points of our dividers to be as sharp as possible so we can come as close as possible to the perfection inherent in geometry.

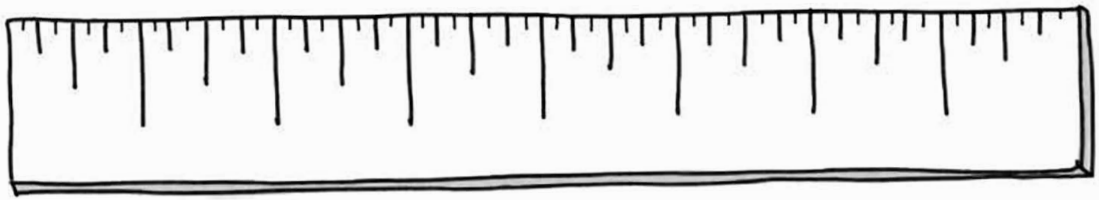
With the legs of our new tool spread apart, we place one tip in the point produced by the awl and *"ex sistere"* (stand out from) that point a certain *"mensura"* (**measure**) with the other leg.

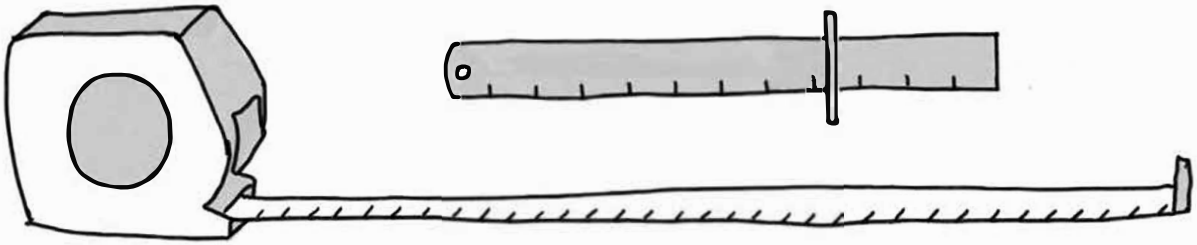
We have not only given *"dimensioni"* (**dimension**), but we have also, apparently, created existence itself! Note that the sharper we make the points of this tool, the more precise the measurement between the two geometric points.



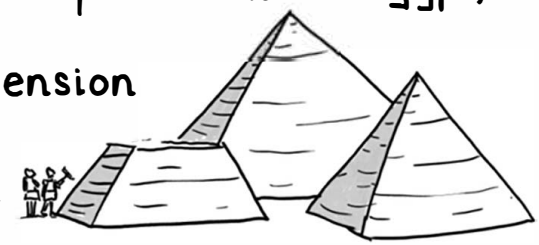


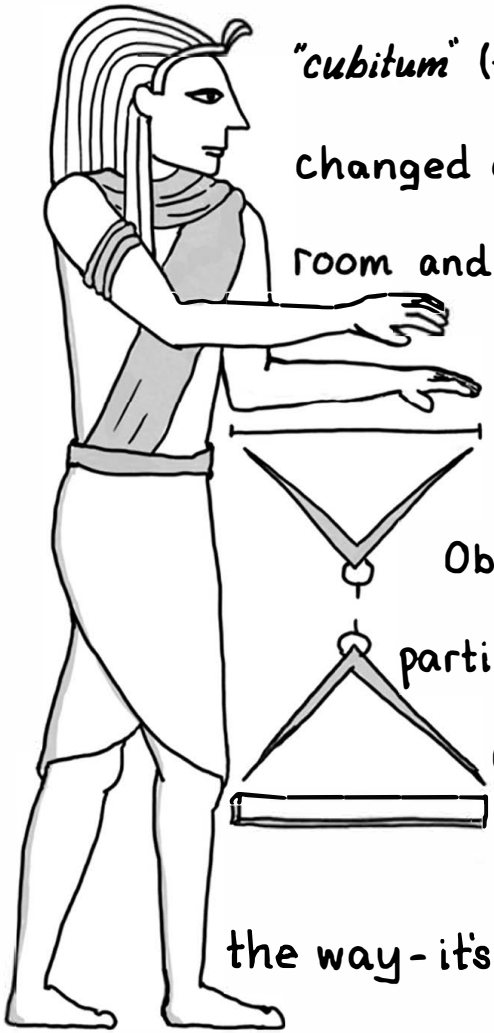
RULERS





For the builders employed by the pharaohs of Egypt, their primary "*existere*" (stand-out) dimension would be the span of their boss's "*cubitum*" (forearm). To ensure that span wouldn't be changed or lost between the pharaoh's dressing room and the construction site, the diligent artisan would etch the dimension into a straight rod of wood and label it a "**cubit**".

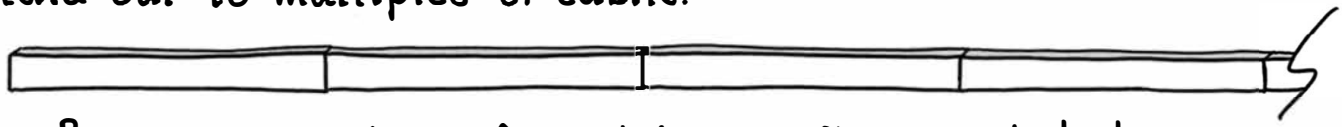




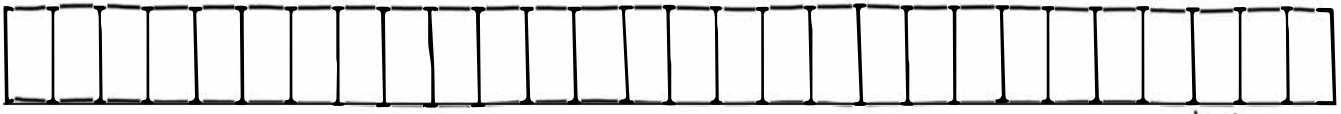
Obviously, all the cubit rods used in that particular pharaoh's reign would have been carefully synchronized. Wood is a good choice for preserving standards, by the way - it's a material that does not change dimension along its length with changes in the environment.

A particular pharoah's cubit would become the module - the common factor - in the layout of buildings and likely furniture during his reign.

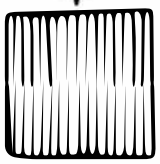
To use the cubit rod as a **ruler** (the name befitting the origin of the cubit's measurement), long lengths would be laid out to multiples of cubits.

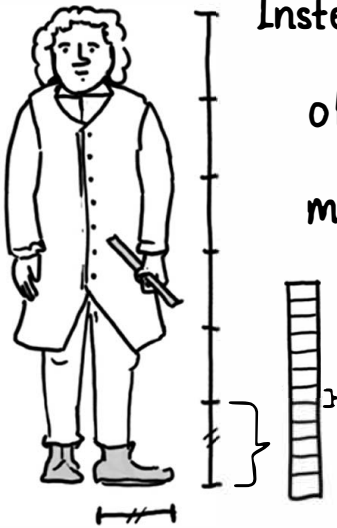


Because a portion of a cubit was often needed, it was segmented into increments of finger widths - 28 to a cubit.



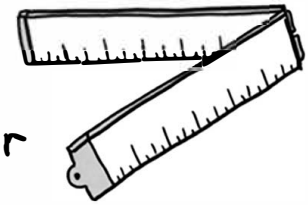
Further refinements of measurement were made by segmenting a finger width, from halves down to 16 portions - close enough for government work apparently.



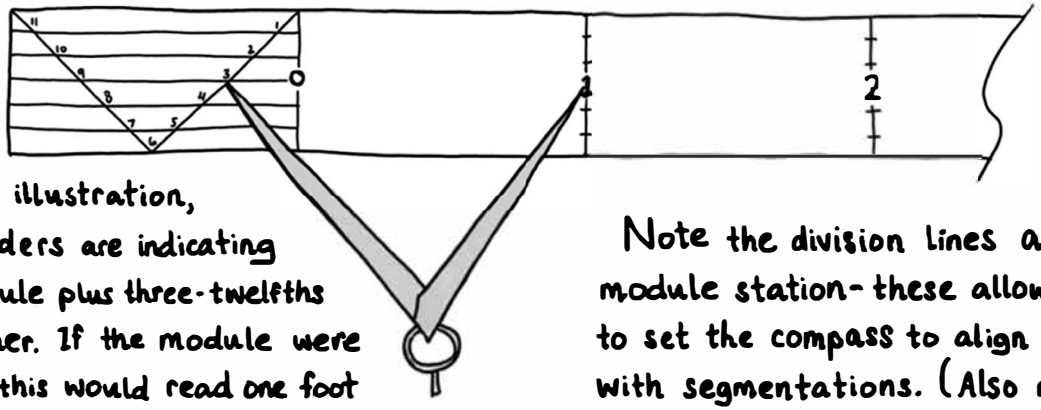


Instead of forearm spans, Europeans went to the span of a foot (1/6 a man's height) as the primary module on their rulers and segmented that into 12 parts- and from there down to 16 parts. More recently they went with the meter and divided it by 10 and 10 again.

Not wanting to carry long wooden rulers around all the time, an anonymous, but nevertheless clever, fellow came up with the idea of hinging and folding sticks together to create the folding rule. Later, someone went one step further and printed the segmentations on a band of fabric tape. Later the ruler tape was made of spring steel- fostering competitions among the construction crews, (at least mine!) to see whose tape could extend the farthest before it became *"flaccidus"* (droopy).



This type of ruler, the **graphic rule**, was originally designed to be used in conjunction with a pair of dividers. All the modules are laid out in whole increments, while one module length set before the first is portioned into a certain number of segments- here 12.



In the illustration, the dividers are indicating one module plus three-twelfths of another. If the module were in feet, this would read one foot three inches. (If the module were an inch, the segmentation would usually be in 16 parts to allow you to refine to 1/16 of an inch.)

Note the division lines at each module station- these allow you to set the compass to align properly with segmentations. (Also note that the segmentation of the zero module were defined by a V to cut in half the number of segments needed at the whole number lines.)

The graphic rule is still in common use on boat and (occasionally) furniture plans to allow you to pick up dimensions from a scaled-down set of plans.