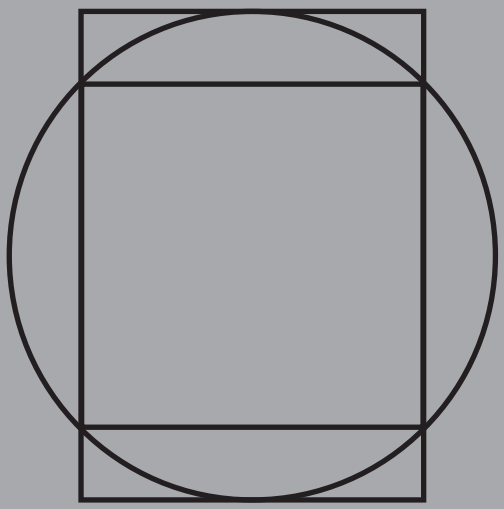
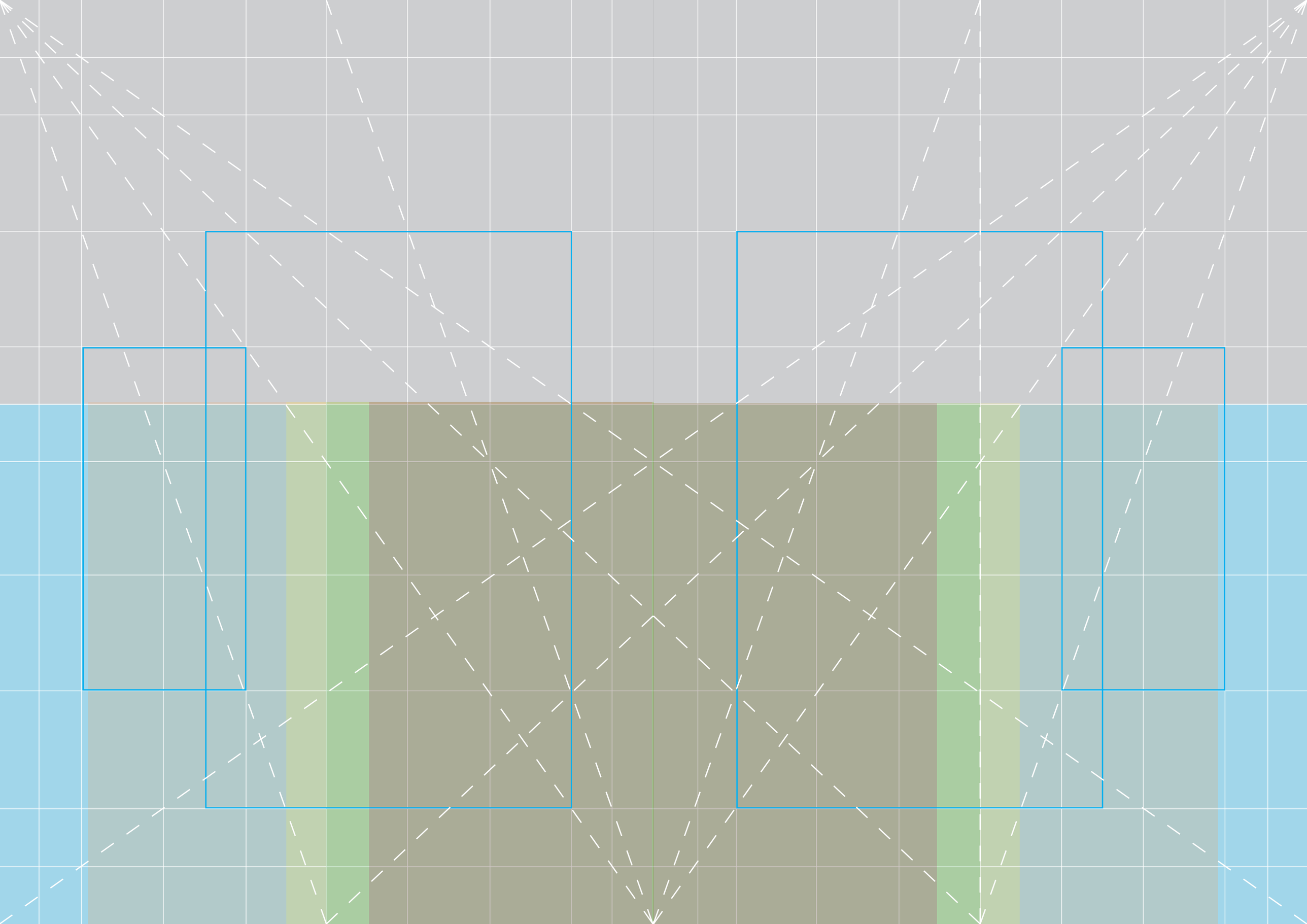
4-8-2014

Environmental Systems and Patterns Applied to Design

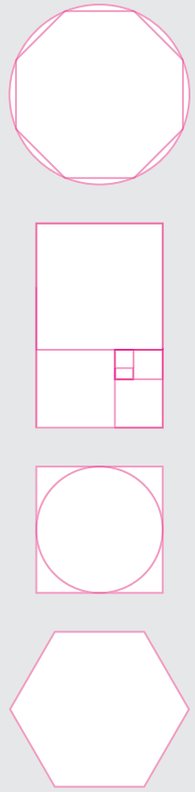
Aaron Cooper
Western Michigan University, a.cooper@aaroncooperdesign.com



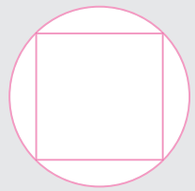


Geometric and Relational Layout

a thesis project by Aaron Cooper



Geometric and Relational Layout



a thesis project by Aaron Cooper

"The page is a piece of paper. It is also a visible and tangible proportion, silently sounding the thoroughbass of the book. On it lies the text block, which must answer to the page. The two together – page and text block – produce an antiphonal geometry. That geometry alone can bond the reader to the book. Or conversely, it can put the reader to sleep, or put the reader's nerves on edge, or drive the reader away."

—Robert Bringhurst

Table of Contents

Introduction

Looking at the variety of organic form in a natural setting is always an eye opening experience. Seeing how those forms are based on a common system in the environment is even more amazing. Applying the concept of form driven by ratios in the environment to design layout seems like a common sense approach to functional design, yet this is not a common solution in modern design.

While geometry has hard-fast rules regarding its form and function, its application tends to be somewhat loose. The variation that geometric form can be applied in design seems endless. A hexagon may fit into a page only one way, but the ways in which its relationship to the page is used can be as different as the designers that use them. As in nature, simple, strict rules allow for variety and diversity, yet maintain continuity. There is a reason why most structures that are man-made look so different from those grown in nature; they don't adhere to the same guidelines that nature does. Organic form maintains an organic aesthetic because it is as much a product of the environment in which it exists, as it is functional. When man-made objects serve a function while mimicking biological form that already serves that function, a beautifully strong, functional object is created. If a page is the originating environment for content with a specific function, the content should look like it's meant to be on the page rather than a manufactured addition to a book for people to notice.

This concept applies especially to digital content, as the media is still considered "new." Because of the formating flexibility in e-readers (Type and size change, color, orientation, etc) layout needs to be flexible and responsive. E-publishing standards have not listed a universal publishing process that allows for dynamic or responsive layout. On rare occasion an e-book that does use a responsive layout is released, but it is in app form with its own set of rules and code issues. This example aside, e-readers can display a spread or a single page at a time depending on how they are held. Geometry that relates to the page might help dictate how the two versions can be displayed similarly, and yet relate to the media in a natural way.

(Introduction Continued)
Applying this concept to environmental design, information layout and placement within a space is crucial for its effectiveness. Capturing the attention of those passing by is the easy part of the equation. Maintaining that attention long enough to convey a message can be a challenging task. Setting information in a space so that it appears as though it belongs there, yet does not blend in to the space is a balance not unlike the layout of a page. Proportion, Geometry and relationships within the space play a major role in its effectiveness.

The examples of relational layout in this book, use page as the environment the content exists within. The design is driven by the function of the content. My intention is to show how relational or proportional layout can influence the effectiveness of the content by binding it to the environment it exists within. These layout examples and geometric applications are not hard-fast rules, but rather a set of tools available to those having to lay out information in any media. Geometry can be used effectively in any number of ways. Conversely, it can also be used to the detriment of the functional content that exists within it. Practice and experimentation, like any other craft, are key in using relational design effectively.

The Content

For simplicity's sake, these specific grid layouts are designed to cater to a narrative prose text with commentary, as well as an optional image per spread.

For demonstration purposes the content for each spread is exactly the same. This takes the emphasis off of the content and focus it on the layout.

Methodology

For consistency and demonstration, all page proportions have a height of 9 inches. This allows for use of a consistent baseline grid and therefore and a base type size consistent for the content layout. This allows comparisons to be drawn between pages that provide roughly the same quantity and, hopefully, quality of content without regard to page and text size.

A 9" page yields 54 base lines set at 12 points.

Using 20% leading, a base text size of 10 provides an optimal character length for a traditional layout of this size.
Type scales vary slightly by page size, since the scale is based off the proportion of the page. All pages use a body type size of 10. Title and subtext sizes are multiples of the proportion they correspond to. (10pt base type in a √2 page size yields a type scale of 7, 10, 14, 20, 28, etc … with a leading set in multiples of 12.)
The typeface for the main content is set in Adobe Garamond for its readability in block form.

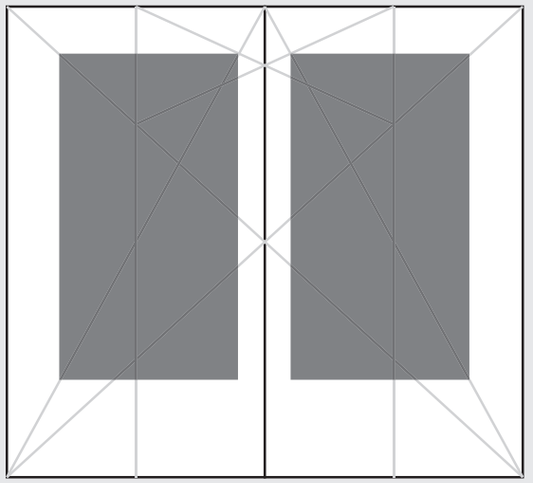
Commentary type size is offset from the text by 20% because of space on the page. A 10-point inset baseline grid establishes a separation of content and allow for a much smaller sans serif typeface to be used. Futura medium is set at 6/10 because of its clear legibility at scale and secondary hierarchy to the narrative.

Images are kept to a minimum in this context due to the nature of the content. The one image that does appear on several spreads is sized according to the grid proportions available or common points on the page as determined by the geometric layout.

Traditional Book Layout

Book layout by pulling diagonals from the corners and centers of pages has been a common practice for centuries. Monks and scribes would layout a book page by geometrically relating content directly to the page proportions.

This method often results in margins that define a text area of the same proportions as the page, yet slightly inset toward the spine and high on the page. If a text was divided into columns it was done by a gutter space dividing the text area. Multiple column layouts can be devised by subdividing the page and pulling similar diagonal relationships to base column grids on.



Book layout by pulling diagonals from key points on the page has been done for hundreds of years.

Chapter VI: Idealism

Thus is the unspeakable but intelligible and practicable meaning of the world conveyed to man, the immortal pupil, in every object of sense. To this one end of Discipline, all parts of nature conspire.

6.1 We move from practical discipline to theoretical idealism.

A noble doubt perpetually suggests itself, whether this end be not the Final Cause of the Universe; and whether nature outwardly exists. It is a sufficient account of that Appearance we call the World, that God will teach a human mind, and so makes it the receiver of a certain number of congruent sensations, which we call sun and moon, man and woman, house and trade. In my utter impotence to test the authenticity of the report of my senses, to know whether the impressions they make on me correspond with outlying objects, what difference does it make, whether Orion is up there in heaven, or some god paints the image in the firmament of the soul? The relations of parts and the end of the whole remaining the same, what is the difference, whether land and sea interact, and worlds revolve and intermingle without number or end, — deep yawning under deep, and galaxy balancing galaxy, throughout absolute space, — or, whether, without relations of time and space, the same appearances are inscribed in the constant faith of man? Whether nature enjoy a substantial existence without, or is only in the apocalypse of the mind, it is alike useful and alike venerable to me. Be it what it may, it is ideal to me, so long as I cannot try the accuracy of my senses.

The frivolous make themselves merry with the Ideal theory, if its consequences were burlesque; as if it affected the stability

6.2 Idealism says that reality is ultimately mental, that whatever exists is an idea in some mind, either our finite minds or God's infinite mind. Materialism is degenerate idealism.

of nature. It surely does not. God never jests with us, and will not compromise the end of nature, by permitting any inconsequence in its procession. Any distrust of the permanence of laws, would paralyze the faculties of man. Their permanence is sacredly respected, and his faith therein is perfect. The wheels and springs of man are all set to the hypothesis of the permanence of nature. We are not built like a ship to be tossed, but like a house to stand. It is a natural consequence of this structure, that, so long as the active powers predominate over the reflective, we resist with indignation any hint that nature is more short-lived or mutable than spirit. The broker, the wheelwright, the carpenter, the toll-man, are much displeased at the intimation.

6.3 Idealism is not silly because God is not capricious. God's thoughts are a permanently fixed rational order; laws of nature are like divine promises, and God keeps his promises because his will is good. Thus we can depend on the rational order of nature for our technology.

But whilst we acquiesce entirely in the permanence of natural laws, the question of the absolute existence of nature still remains open. It is the uniform effect of culture on the human mind, not to shake our faith in the stability of particular phenomena, as of heat, water, azote; but to lead us to regard nature as a phenomenon, not a substance; to attribute necessary existence to spirit; to esteem nature as an accident and an effect.

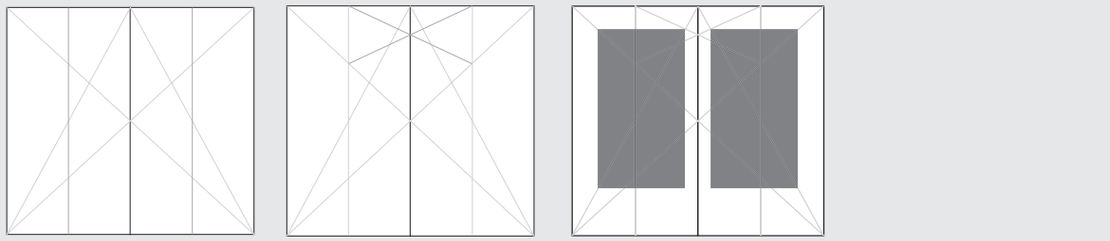
To the senses and the unrenewed understanding, belongs a sort of instinctive belief in the absolute existence of nature. In their view, man and nature are indissolubly joined. Things are ultimates, and they never look beyond their sphere. The presence of Reason mars this faith. The first effort of thought tends to relax this despotism of the senses, which binds us to nature as if we were a part of it, and shows us nature aloof, and, as it were, afloat. Until this higher agency intervened, the animal eye sees, with wonderful accuracy, sharp outlines and colored surfaces. When the eye of Reason opens, to outline and surface are at once added, grace and expression. These proceed from imagination and affection, and abate somewhat of the angular distinctness of objects. If the Reason be stimulated to

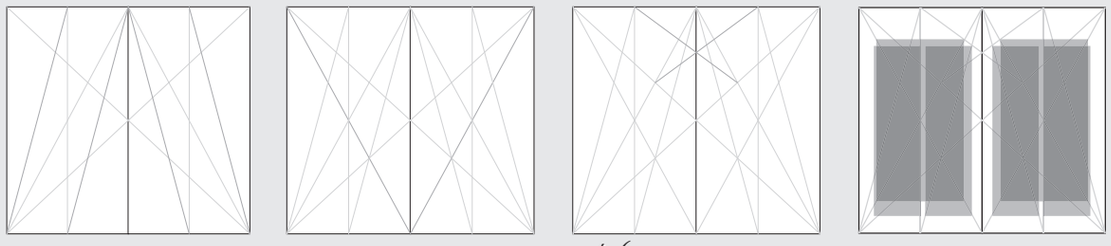
Type scale:

Subtext: 6pt
Body: 10pt
Title: 18pt
34 pt
Baseline: 12 pt

Traditional Book Layout

Proportion – 1:1.836735
Page – 4.9" x 9"





Traditional book layout uses the page proportions to build relationships between the spread and the page. This effectively groups content across the spread.

By subdividing the page further, columns ca be established. Finding the relationships between the two types of grids can yield some interesting interactions with content.

“The Tall Octagon”

Dimensions used 4.9" x 9"

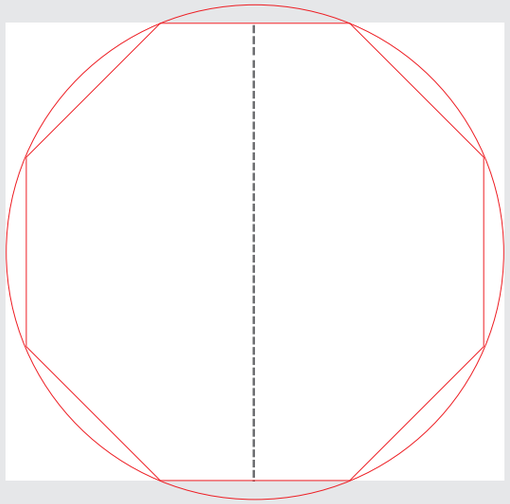
Proportional ratio ≈ 1:1.8367

An octagon is an 8 sided, closed, flat shape. A regular octagon has 8 equal sides who’s interior angles equal 135°. The center angle of a regular octagon is 45°.

A regular octagon can be encompassed by a circle so that every vertex within it touches a circle at 8 equal distances.

In the instance of a “Tall Octagon” the spread is proportioned so that the top and bottom of the circle sit on the edge of the page, but two of the sides of a regular octagon will sit on the left and right outer edge of the pages.

The Octagon is less prevalent in nature than hexagons and pentagons. Coincidentally, it offers less interesting layout variations than other shapes.



Chapter VI:
Idealism

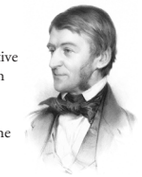
Thus is the unspeakable but intelligible and practicable meaning of the world conveyed to man, the immortal pupil, in every object of sense. To this one end of Discipline, all parts of nature conspire.

6.1 We move from practical discipline to theoretical idealism.

A noble doubt perpetually suggests itself, whether this end be not the Final Cause of the Universe; and whether nature outwardly exists. It is a sufficient account of that Appearance we call the World, that God will teach a human mind, and so makes it the receiver of a certain number of congruent sensations, which we call sun and moon, man and woman, house and trade. In my utter impotence to test the authenticity of the report of my senses, to know whether the impressions they make on me correspond with outlying objects, what difference does it make, whether Orion is up there in heaven, or some god paints the image in the firmament of the soul? The relations of parts and the end of the whole remaining the same, what is the difference, whether land and sea interact, and worlds revolve and intermingle without number or end, — deep yawning under deep, and galaxy balancing galaxy, throughout absolute space, — or, whether, without relations of time and space, the same appearances are inscribed in the constant faith of man? Whether nature enjoy a substantial existence without, or is only in the apocalypse of the mind, it is alike useful and alike venerable to me. Be it what it may, it is ideal to me, so long as I cannot try the accuracy of my senses.

6.2 Idealism says that reality is ultimately mental, that whatever exists is an idea in some mind, either our finite minds or God's infinite mind. Materialism is degenerate idealism.

The frivolous make themselves merry with the Ideal theory, if its consequences were burlesque; as if it affected the stability of nature. It surely does not. God never jests with us, and will not compromise the end of nature, by permitting any inconsequence in its procession. Any distrust of the permanence of laws, would paralyze the faculties of man. Their permanence is sacredly respected, and his faith therein is perfect. The wheels and springs of man are all set to the hypothesis of the permanence of nature. We are not built like a ship to be tossed, but like a house to stand. It is a natural consequence of this structure, that, so long as the active powers predominate over the reflective, we resist with indignation any hint that nature is more short-lived or mutable than spirit. The broker, the wheelwright, the carpenter, the toll-man, are much displeased at the intimation.



But whilst we acquiesce entirely in the permanence of natural laws, the question of the absolute existence of nature still remains open. It is the uniform effect of culture on the human mind, not to shake our faith in the stability of particular phenomena, as of heat, water, azote; but to lead us to regard nature as a phenomenon, not a substance; to attribute necessary existence to spirit; to esteem nature as an accident and an effect.

6.3 Idealism is not silly because God is not capricious. God's thoughts are a permanently fixed rational order; laws of nature are like divine promises, and God keeps his promises because his will is good. Thus we can depend on the rational order of nature for our technology.

To the senses and the unrenewed understanding, belongs a sort of instinctive belief in the absolute existence of nature. In their view, man and nature are indissolubly joined. Things are ultimates, and they never look beyond their sphere. The presence of Reason mars this faith. The first effort of thought tends to relax this despotism of the senses, which binds us to nature as if we were a part of it, and shows us nature aloof, and, as it were, afloat. Until this higher agency intervened, the

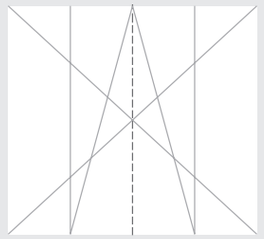
Type scale:

Subtext:	**6pt**
Body:	**10pt**
Title:	**18pt**
	34 pt
Baseline:	**12 pt**

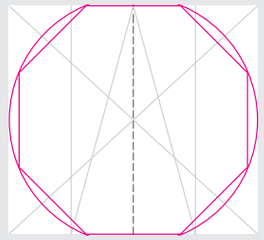
Geometry: "Tall Octagon"

Proportion ≈ 1:1.836735

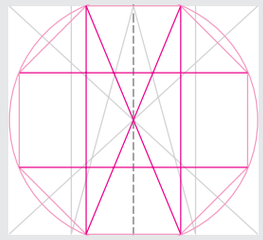
Page dimension: 4.9" x 9"

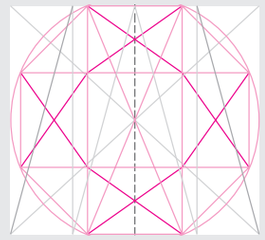


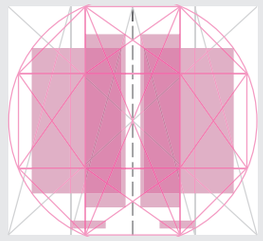
Establish spread/page relationships by starting out much like a traditional layout would.



Apply geometry to the spread or page.







Find relatonships between geometry and the page. This can effectively "bind" the content to the page layout.

“Golden Ratio” (1.61803398875…)

Dimentions used: 5.6"x 9"

Proportional ratio ≈ 1:1.607

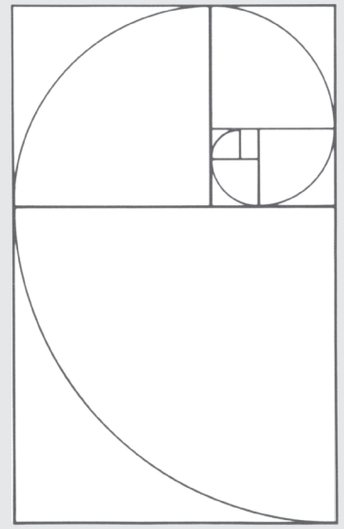
The golden ratio is prevalent throughout nature and influences many systems of growth. The Fibonacci sequence is proportionally based off the golden ratio. Snowflakes, capillary growth, root systems, and much more is based off of the golden ratio.

The golden ratio manifests in many forms, two of which are spirals and rectangles. To draw (and understand) a golden rectangle it is easiest to start with a square.

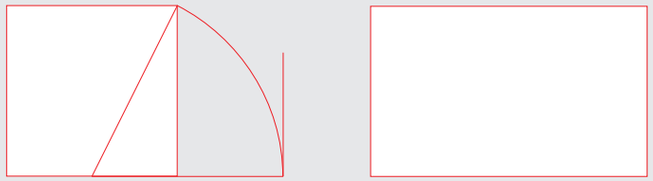
Bisect one side of the square with a line that extends across the square to an opposing corner.

From the bisecting point, transfer the length of the line previously drawn along and past the side of the square. This establishes the long side of a golden rectangle as well as the short side of the next rectangle of the same proportion.

These rectangles nest themselves proportionally and get exponentially larger or smaller.
Because of the variation in applications and translation of this proportion, layout possibilities are ample. Experimentation and good judgment on how content is



Golden rectangles with Golden Spiral



Creating a Golden Proportion from a square.

Chapter VI: Idealism

6.1 We move from practical discipline to theoretical idealism.

Thus is the unspeakable but intelligible and practicable meaning of the world conveyed to man, the immortal pupil, in every object of sense. To this one end of Discipline, all parts of nature conspire.

6.2 Idealism says that reality is ultimately mental, that whatever exists is an idea in some mind, either our finite minds or God's infinite mind. Materialism is degenerate idealism.

A noble doubt perpetually suggests itself, whether this end be not the Final Cause of the Universe; and whether nature outwardly exists. It is a sufficient account of that Appearance we call the World, that God will teach a human mind, and so makes it the receiver of a certain number of congruent sensations, which we call sun and moon, man and woman, house and trade. In my utter impotence to test the authenticity of the report of my senses, to know whether the impressions they make on me correspond with outlying objects, what difference does it make, whether Orion is up there in heaven, or some god paints the image in the firmament of the soul? The relations of parts and the end of the whole remaining the same, what is the difference, whether land and sea interact, and worlds revolve and intermingle without number or end, — deep yawning under deep, and galaxy balancing galaxy, throughout absolute space, — or, whether, without relations of time and space, the same appearances are inscribed in the constant faith of man? Whether nature enjoy a substantial existence without, or is only in the apocalypse of the mind, it is alike useful and alike venerable to me. Be it what it may, it is ideal to me, so long as I cannot try the accuracy of my senses.

The frivolous make themselves merry with the Ideal theory, if its consequences were burlesque; as if it affected the stability of nature. It surely does not. God never jests with us, and will not compromise the end of nature, by permitting any inconsequence in its procession. Any distrust of the permanence of laws, would paralyze the faculties of man. Their permanence is sacredly respected, and his faith therein is perfect. The wheels and springs of man are all set to the hypothesis of the permanence of nature. We are not built like a ship to be tossed, but like a house to stand. It is a natural consequence of this structure, that, so long as the active powers predominate over the reflective, we resist with indignation any hint that nature is more short-lived or mutable than spirit. The broker, the wheelwright, the carpenter, the toll-man, are much displeased at the intimation.

6.3 Idealism is not silly because God is not capricious. God's thoughts are a permanently fixed rational order; laws of nature are like divine promises, and God keeps his promises because his will is good. Thus we can depend on the rational order of nature for our technology.

But whilst we acquiesce entirely in the permanence of natural laws, the question of the absolute existence of nature still remains open. It is the uniform effect of culture on the human mind, not to shake our faith in the stability of particular phenomena, as of heat, water, azote; but to lead us to regard nature as a phenomenon, not a substance; to attribute necessary existence to spirit; to esteem nature as an accident and an effect.

6.4 Nature is not ultimately real; it is a system of appearances.

To the senses and the unrenewed understanding, belongs a sort of instinctive belief in the absolute existence of nature. In their view, man and nature are indissolubly joined. Things are ultimates, and they never look beyond their sphere. The presence of Reason mars this faith. The first effort of thought tends to relax this despotism of the senses, which binds us to nature as if we were a part of it, and shows us nature aloof, and, as it were, afloat. Until this higher agency intervened, the animal eye sees, with wonderful accuracy, sharp outlines and colored surfaces. When the eye of Reason

Type scale:

Subtext: 6pt

Body: 10pt

Title: 16pt

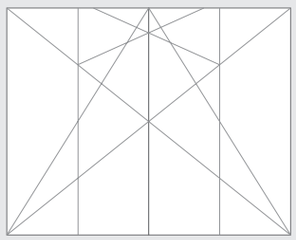
29 pt

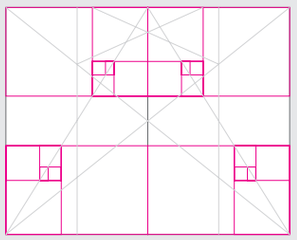
Baseline: 12 pt

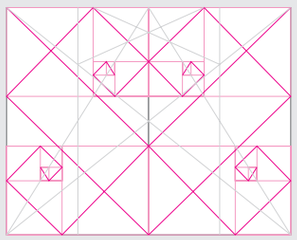
Geometry: "Golden Ratio"

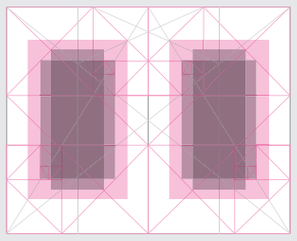
Proportion ≈ 1 : 1.618033 (φ)

Page Dimension : 5.6" x 9"









The golden ratio can be applied in many ways. Using nature as a reference and being intentional about how and why a certain method is applied, will definitely help add depth to the layout and emphasize the content.

The golden rectangle is great to use on other media besides paper. Many screen resolutions are close to, if not modeled after the golden ratio.

translated through layout are needed.

“Square”

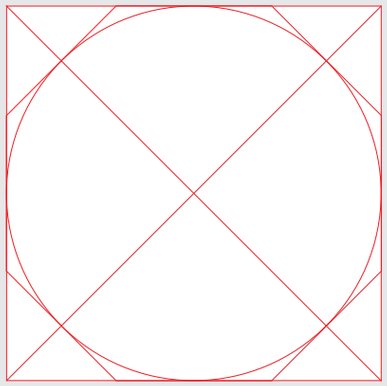
Page Dimensions: 9" x 9"

Proportional ratio = 1:1

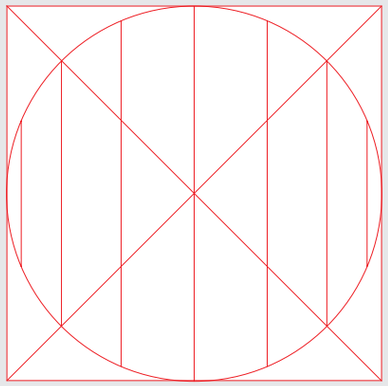
Square proportions are relatively straightforward to work with. Squares can be proportionally sized to tile, breaking down the grid into smaller columns and rows. Rather than using a square, a circle can be used instead. Dividing the circumference into equal parts that are divisible by four, an even and harmonic grid can be expanded into the page environment.

Due to the symmetrical nature of both circle and square, carrying a grid system onto the opposite page (rather than reflecting it) can be done easily if needed.

There is enough room on the page for multiple columns of narrative text, as well as room for commentary below the main narrative block.



Square, circle and octagon.



Harmonic grid lines from circle

Chapter VI: Idealism

Thus is the unspeakable but intelligible and practicable meaning of the world conveyed to man, the immortal pupil, in every object of sense. To this one end of Discipline, all parts of nature conspire.

A noble doubt perpetually suggests itself, whether this end be not the Final Cause of the Universe; and whether nature outwardly exists. It is a sufficient account of that Appearance we call the World, that God will teach a human mind, and so makes it the receiver of a certain number of congruent sensations, which we call sun and moon, man and woman, house and trade. In my utter impotence to test the authenticity of the report of my senses, to know whether the impressions they make on me correspond with outlying objects, what difference does it make, whether Orion is up there in heaven, or some god paints the image in the firmament of the soul? The relations of parts and the end of the whole remaining the same, what is the difference, whether land and sea interact, and worlds revolve and intermingle without number or end, — deep yawning under deep, and galaxy balancing galaxy, throughout absolute space, — or, whether, without relations of time and space, the same appearances are inscribed in the constant faith of man? Whether nature enjoy a substantial existence without, or is only in the apocalypse of the mind, it is alike useful and alike venerable to me. Be it what it may, it is ideal to me, so long as I cannot try the accuracy of my senses.

6.1 We move from practical discipline to theoretical idealism.

6.2 Idealism says that reality is ultimately mental, that whatever exists is an idea in some mind, either our finite minds or God's infinite mind. Materialism is degenerate idealism.

The frivolous make themselves merry with the Ideal theory, if its consequences were burlesque; as if it affected the stability of nature. It surely does not. God never jests with us, and will not compromise the end of nature, by permitting any inconsequence in its procession. Any distrust of the permanence of laws, would paralyze the faculties of man. Their permanence is sacredly respected, and his faith therein is perfect. The wheels and springs of man are all set to the hypothesis of the permanence of nature. We are not built like a ship to be tossed, but like a house to stand. It is a natural consequence of this structure, that, so long as the active powers predominate over the reflective, we resist with indignation any hint that nature is more short-lived or mutable than spirit. The broker, the wheelwright, the carpenter, the toll-man, are much displeased at the intimation.

But whilst we acquiesce entirely in the permanence of natural laws, the question of the absolute existence of nature still remains open. It is the uniform effect of culture on the human mind, not to shake our faith in the stability of particular phenomena, as of heat, water, azote; but to lead us to regard nature as a phenomenon, not a substance; to attribute necessary existence to spirit; to esteem nature as an accident and an effect.

To the senses and the unrenewed understanding, belongs a sort of instinctive belief in the absolute existence of nature. In their view, man and nature are indissolubly joined. Things are ultimates, and they never look beyond their sphere. The presence of Reason mars this faith. The first effort of thought tends to relax this despotism of the senses, which binds us to nature as if we were a part of it, and shows us nature aloof, and, as it were, afloat. Until this higher agency intervened, the animal eye sees, with wonderful accuracy, sharp outlines and colored surfaces. When the eye of Reason opens, to outline and surface are at once added, grace and expression. These proceed from imagination and affection, and abate somewhat of the angular distinctness of objects. If the Reason be stimulated to more earnest vision, outlines and surfaces become transparent, and are no longer seen; causes and spirits are seen through them. The best moments of life are these delicious awakenings of the higher powers, and the reverential withdrawing of nature before its God. Let us proceed to indicate the effects of culture.

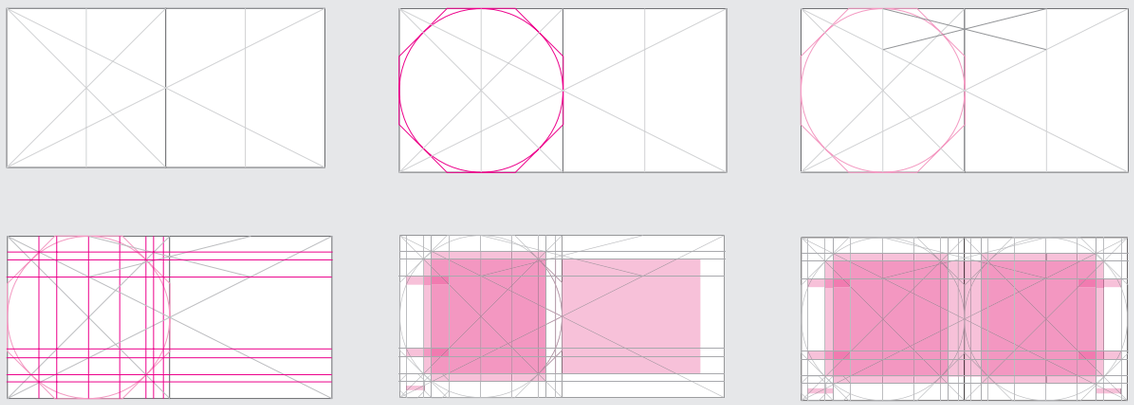
6.3 Idealism is not silly because God is not capricious. God's thoughts are a permanently fixed rational order; laws of nature are like divine promises, and God keeps his promises because his will is good. Thus we can depend on the rational order of nature for our technology.

6.4 Nature is not ultimately real; it is a system of appearances.

Geometry: "Square"

Proportion = 1:1

Page dimension: 9" x 9"



Square formats are traditionally difficult to work with. They can be used to great benefit or great detriment to a body of work, regardless of the form or function. Its form is confining and awkward, since our field of vision is not a square. Therefore it is unnatural to look at for a prolonged length of time.

The spreads, however are nice. Content should be laid out as though it should flow from one page to another, like landscape.

Type scale:

Subtext:	**6pt**
Body:	**10pt**
Title:	**20pt**
	30 pt
Baseline:	**12 pt**

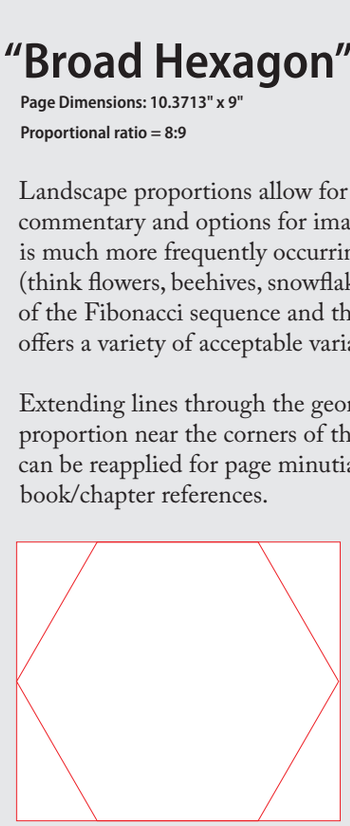
“Broad Hexagon”

Page Dimensions: 10.3713" x 9"

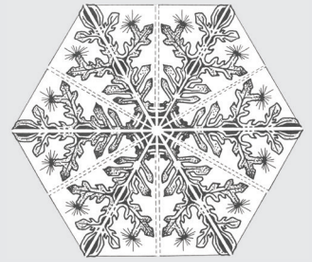
Proportional ratio = 8:9

Landscape proportions allow for multiple columns, commentary and options for image placement. The hexagon is much more frequently occurring in nature than the square (think flowers, beehives, snowflakes, etc.) since, it is based off of the Fibonacci sequence and the golden ratio. It therefore offers a variety of acceptable variations for layout.

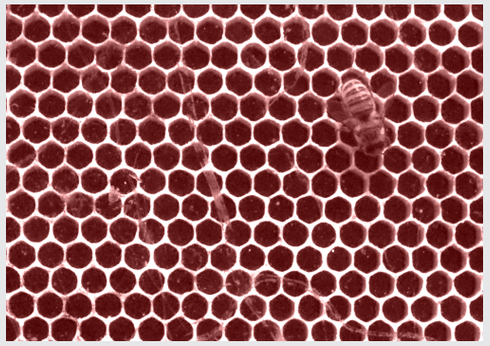
Extending lines through the geometry creates a smaller page proportion near the corners of the page, where the geometry can be reapplied for page minutia, such as page numbers and book/chapter references.



Broad Hexagon page geometry



Hexagonal geometry in a Snowflake.



Bee hive hexagon construction.

Chapter VI: Idealism

Thus is the unspeakable but intelligible and practicable meaning of the world conveyed to man, the immortal pupil, in every object of sense. To this one end of Discipline, all parts of nature conspire.

6.1 We move from practical discipline to theoretical idealism.

A noble doubt perpetually suggests itself, whether this end be not the Final Cause of the Universe; and whether nature outwardly exists. It is a sufficient account of that Appearance we call the World, that God will teach a human mind, and so makes it the receiver of a certain number of congruent sensations, which we call sun and moon, man and woman, house and trade. In my utter impotence to test the authenticity of the report of my senses, to know whether the impressions they make on me correspond with outlying objects, what difference does it make, whether Orion is up there in heaven, or some god paints the image in the firmament of the soul? The relations of parts and the end of the whole remaining the same, what is the difference, whether land and sea interact, and worlds revolve and intermingle without number or end, — deep yawning under deep, and galaxy balancing galaxy, throughout absolute space, — or, whether, without relations of time and space, the same appearances are inscribed in the constant faith of man? Whether nature enjoy a substantial existence without, or is only in the apocalypse of the mind, it is alike useful and alike venerable to me. Be it what it may, it is ideal to me, so long as I cannot try the accuracy of my senses.

6.2 Idealism says that reality is ultimately mental, that whatever exists is an idea in some mind, either our finite minds or God's infinite mind. Materialism is degenerate idealism.

The frivolous make themselves merry with the Ideal theory, if its consequences were burlesque; as if it affected the stability of nature. It surely does not. God never jests with us, and will not compromise the end of nature, by permitting any inconsequence in its procession. Any distrust of the permanence of laws, would paralyze the faculties of man. Their permanence is sacredly respected, and his faith therein is perfect. The wheels and springs of man are all set to the hypothesis of the permanence of nature. We are not built like a ship to be tossed, but like a house to stand. It is a natural consequence of this structure, that, so long as the active powers predominate over the reflective, we resist with indignation any hint that nature is more short-lived or mutable than spirit. The broker, the wheelwright, the carpenter, the toll-man, are much displeased at the intimation.

But whilst we acquiesce entirely in the permanence of natural laws, the question of the absolute existence of nature still remains open. It is the uniform effect of culture on the human mind, not to shake our faith in the stability of particular phenomena, as of heat, water, azote; but to lead us to regard nature as a phenomenon, not a substance; to attribute necessary existence to spirit; to esteem nature as an accident and an effect.

6.3 Idealism is not silly because God is not capricious. God's thoughts are a permanently fixed rational order; laws of nature are like divine promises, and God keeps his promises because his will is good. Thus we can depend on the rational order of nature for our technology.

6.4 Nature is not ultimately real; it is a system of appearances.

To the senses and the unrenewed understanding, belongs a sort of instinctive belief in the absolute existence of nature. In their view, man and nature are indissolubly joined. Things are ultimates, and they never look beyond their sphere. The presence of Reason mars this faith. The first effort of thought tends to relax this despotism of the senses, which binds us to nature as if we were a part of it, and shows us nature aloof, and, as it were, afloat. Until this higher agency intervened, the animal eye sees, with wonderful accuracy, sharp outlines and colored surfaces. When the eye of Reason opens, to outline and surface are at once added, grace and expression. These proceed from imagination and affection, and abate somewhat of the angular distinctness of objects. If the Reason be stimulated to more earnest vision, outlines and surfaces become transparent, and are no longer seen; causes and spirits are seen through them. The best moments of life are these delicious awakenings of the higher powers, and the reverential withdrawing of nature before its God. Let us proceed to indicate the effects of culture.

1. Our first institution in the Ideal philosophy is a hint from nature herself.

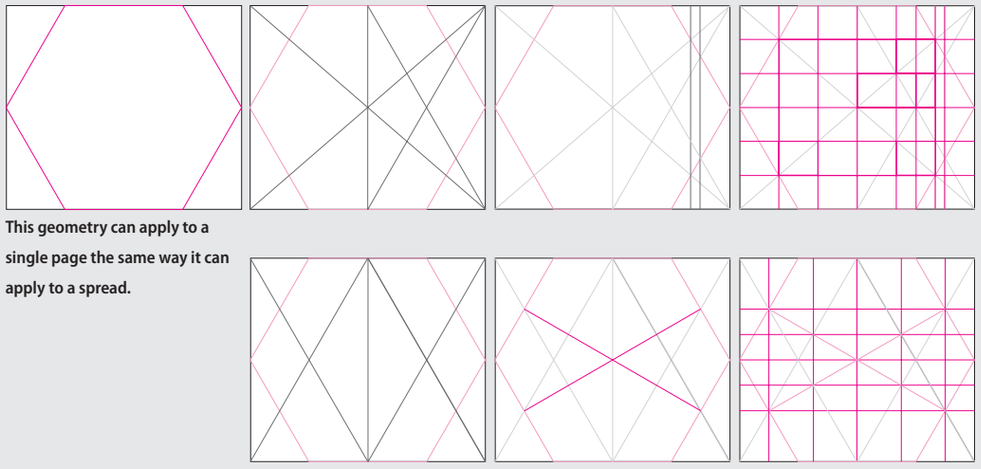
Nature is made to conspire with spirit to emancipate us. Certain mechanical changes, a small alteration in our local position apprizes us of a dualism. We are strangely affected by seeing the shore from a moving ship, from a balloon, or through the tints of an unusual sky. The least change in our point of view, gives the whole world a pictorial air. A man who seldom rides, needs only to get into a coach and traverse his own town, to turn the street into a puppet-show. The men, the women, — talking, running, bartering, fighting, — the earnest mechanic, the lounger, the beggar, the boys, the dogs, are unrealized at once, or, at least, wholly detached from all relation to the observer, and seen as apparent, not substantial beings. What new thoughts are suggested by seeing a face of country quite

6.5 The eye of the body sees colors; the senses perceive concrete qualities; but the eye of the soul sees abstract forms. This is Emerson's Platonism, filtered through Berkeley and Hegel.

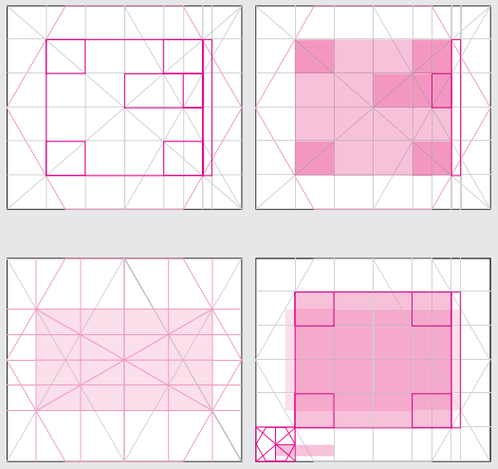
Geometry: "Broad Hexagon"

Proportion ≈ 1:1.1524

Page dimension: 10.3713" x 9"



This geometry can apply to a single page the same way it can apply to a spread.



Type scale:

Subtext:	**7 pt**
Body:	**10 pt**
	11 pt
	17 pt
Title:	**20 pt**
	23 pt
Baseline:	**12 pt**

By extending lines through the geometry, smaller page proportions are drawn naturally. These can be used for page minutia like page numbers or section titles.

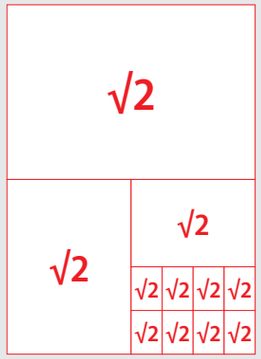
“√2”

Page Dimensions: 9" x 6.364"

Proportional ratio = 1:1.41421356 (√2)

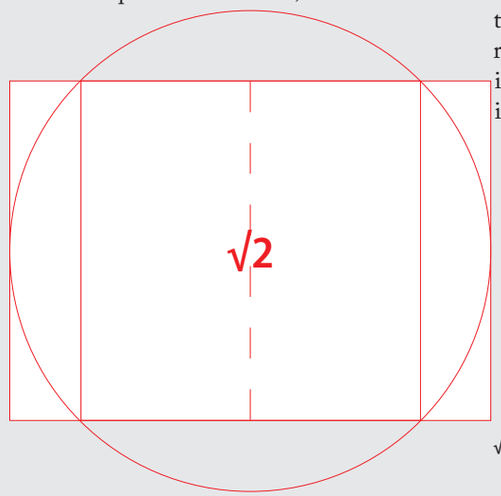
√2 rectangles are the only rectangles that maintain their proportional ratio as they are divided in half lengthwise. This makes them versatile when subdividing for a grid.

The book you hold now was designed using a √2 modular grid. Due to the variation in content, it was the most flexible page size to work with as far as content compliance with a grid system.
Since the page itself is the starting point for the grid system, the geometry to page relationships are plenty; in fact many of the page cross diagonal lines will fall across the corner of a √2 grid box.



√2 rectangle subdivision

As far as geometric relational layout is concerned, the √2 rectangle has another option using a square that shares the height of the page, centered horizontally on the spread, along with a circle that rests on the 4 corners of the square as well as the page ends. This guide can be used to pull horizontal relationships from the circle, and vertical relationships from the square, resulting in some interesting



√2 with geometry

Chapter VI: Idealism

6.1 We move from practical discipline to theoretical idealism.

Thus is the unspeakable but intelligible and practicable meaning of the world conveyed to man, the immortal pupil, in every object of sense. To this one end of Discipline, all parts of nature conspire.

A noble doubt perpetually suggests itself, whether this end be not the Final Cause of the Universe; and whether nature outwardly exists. It is a sufficient account of that Appearance we call the World, that God will teach a human mind, and so makes it the receiver of a certain number of congruent sensations, which we call sun and moon, man and woman, house and trade. In my utter impotence to test the authenticity of the report of my senses, to know whether the impressions they make on me correspond with outlying objects, what difference does it make, whether Orion is up there in heaven, or some god paints the image in the firmament of the soul? The relations of parts and the end of the whole remaining the same, what is the difference, whether land and sea interact, and worlds revolve and intermingle without number or end, — deep yawning under deep, and galaxy balancing galaxy, throughout absolute space, — or, whether, without relations of time and space, the same appearances are inscribed in the constant faith of man? Whether nature enjoy a substantial existence without, or is only in the apocalypse of the mind, it is alike useful and alike venerable to me. Be it what it may, it is ideal to me, so long as I cannot try the accuracy of my senses.

6.2 Idealism says that reality is ultimately mental, that whatever exists is an idea in some mind, either our finite minds or God's infinite mind. Materialism is degenerate idealism.

The frivolous make themselves merry with the Ideal theory, if its consequences were burlesque; as if it affected the stability of nature. It surely does not. God never jests with us, and will not compromise the end of nature, by permitting any inconsequence in its procession. Any distrust of the permanence of laws, would paralyze the faculties of man. Their permanence is sacredly respected, and his faith therein is perfect. The wheels and springs of man are all set to the hypothesis of the

permanence of nature. We are not built like a ship to be tossed, but like a house to stand. It is a natural consequence of this structure, that, so long as the active powers predominate over the reflective, we resist with indignation any hint that nature is more short-lived or mutable than spirit. The broker, the wheelwright, the carpenter, the toll-man, are much displeased at the intimation.

6.3 Idealism is not silly because God is not capricious. God's thoughts are a permanently fixed rational order; laws of nature are like divine promises, and God keeps his promises because his will is good. Thus we can depend on the rational order of nature for our technology.

6.4 Nature is not ultimately real; it is a system of appearances.

But whilst we acquiesce entirely in the permanence of natural laws, the question of the absolute existence of nature still remains open. It is the uniform effect of culture on the human mind, not to shake our faith in the stability of particular phenomena, as of heat, water, azote; but to lead us to regard nature as a phenomenon, not a substance; to attribute necessary existence to spirit; to esteem nature as an accident and an effect.

To the senses and the unrenewed understanding, belongs a sort of instinctive belief in the absolute existence of nature. In their view, man and nature are indissolubly joined. Things are ultimates, and they never look beyond their sphere. The presence of Reason mars this faith. The first effort of thought tends to relax this despotism of the senses, which binds us to nature as if we were a part of it, and shows us nature aloof, and, as it were, afloat. Until this higher agency intervened, the animal eye sees, with wonderful accuracy, sharp outlines and colored surfaces. When the eye of Reason opens, to outline and surface are at once added, grace and expression. These proceed from imagination and affection, and abate somewhat of the angular distinctness of objects. If the Reason be stimulated to more earnest vision, outlines and surfaces become transparent, and are no longer seen; causes and spirits are seen through them. The best moments of life are these delicious awakenings of the higher powers, and the reverential withdrawing of nature before its God. Let us proceed to indicate the effects of culture.

1. Our first institution in the Ideal philosophy is a hint from nature herself.

6.5 The eye of the body sees colors; the senses perceive concrete qualities; but the eye of the soul sees abstract forms. This is Emerson's Platonism, filtered through Berkeley and Hegel.

Nature is made to conspire with spirit to emancipate us. Certain mechanical changes, a small alteration in our local position apprizes us of a dualism. We are strangely affected by seeing the shore from a moving ship, from a balloon,

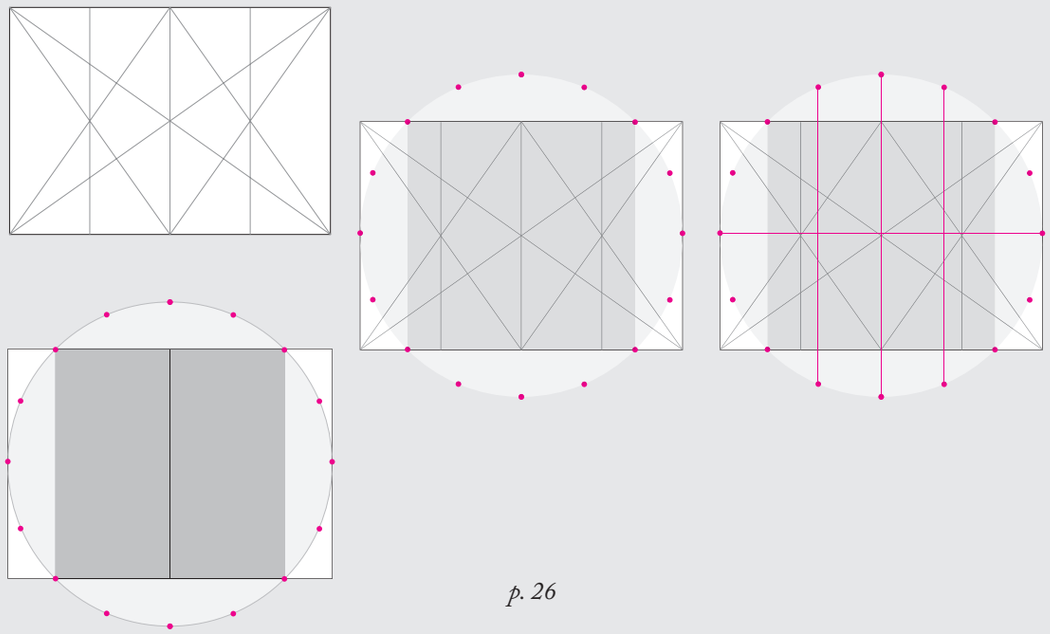
Type scale:

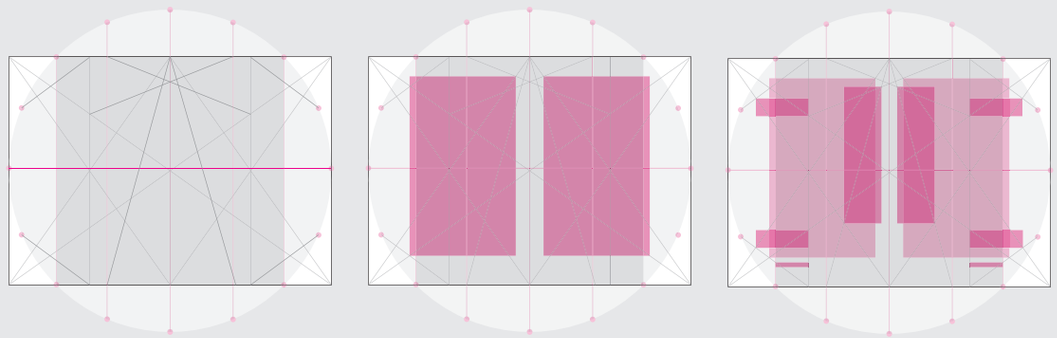
Subtext:	**6pt**
Body:	**10pt**
Title:	**18pt**
	34 pt
Baseline:	**12 pt**

Geometry: √2, "Nested Square in Circle"

Proportion ≈ 1:1.41421 (√2)

Page dimension: 6.364" x 9"





Natural Systems and Patterns Applied to Graphic Design

by Aaron Cooper

Examining how limitations dictate the harmonious relationships between nature's elements shows a consistent proportion among most things found in our environment. Though they're distinctly unique, different organisms across class and kingdom have a relationship through the golden ratio (Doezi, György Power of Limits). This is popularly outlined in the patterns we see in pinecones, sunflower seeds, conch shells and spiral galaxies but also in the way water splashes and eddies, how storms spiral (Ball, Phillip. Flow) human proportion (Clayton & Philo), various fish, as well as the foliating patterns and branching of plants (Doezi, György.Power of Limits). Even at the cellular level, there seems to be a relationship between organisms such as coral or 'few celled organisms' and how they reproduce or develop (Waddington, C.). There is overwhelming evidence of a common system in place that enables nature to function as a whole, in balance. The system is distilled down to what we know as the golden ratio or phi (Doezi, György. Power of Limits), as known by the Greeks, who used it religiously in their architecture. Leonardo da Vinci also documented the golden ratio during his observation of human anatomy as well as his obsessive study of hydrodynamics. His sketches of turbulent water are extremely accurate when compared to computer-generated analysis we use today —in fact, many of the laws of hydrodynamics were actually written by da Vinci (Ball, Phillip. Flow).

One of the laws of hydrodynamics can predict when turbulence starts to become visible in relationship to obstructions and to what extent. This is particularly interesting when introducing man-made obstructions, like pillars in a river. These rarely fall into the same system that nature is harmoniously balanced by, however the systems interact and produce unique results. The flow velocity at which eddies first appear, multiplied by the diameter of an obstruction and divided by the viscosity of the liquid, is always a constant (Ball, Phillip. Flow). Which means it is ratio, or a "dimensionless number." The result is a scalable eddy, which individually follows (roughly) the same rational behavior as storm patterns yet are dynamic in their relation to size. The combination of these systems working in concert is turbulence, which is potentially resolved later down stream as the inertia of the more temporary system dissipates. The realization that two systems were produced with a common relationship made me realize that the important thing in this study wasn't necessarily the golden ratio, but ratios in context.

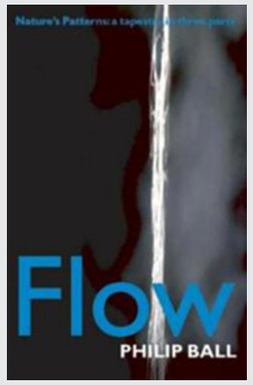
Grid systems in design are based on page dimension (Samara, Timothy. Making and Breaking the Grid), and are largely based on content and purpose. Modular systems can be easily produced arbitrarily with software, but intentionally choosing a system based on content is best. Media ratio can and should dictate the grid system just as much as content (Elam, Kimberly). Breaking down a media into relational pieces can highlight potential grid systems. DIN media standards are produced in a way that they naturally echo ratios when subdivided. Alternatively, using basic geometry, hexagonal shapes related to page dimension for example, can produce unique layout systems that are visually appealing (Samara, Timothy. Making and Breaking the Grid). This is the same concept as the golden ratio that is found in nature. It follows a system that is repeated in all elements within itself, or is used in harmonious relationship with another system. Stephan Wolfram's, A New Kind of Science, highlights the idea that simple sets of rules can produce unexpected results as illustrated in his computer program studies. A set of rules that a program was supposed to follow created a result that was completely unexpected and beautiful. We can see this played out in fractals found in nature, (i.e.: snowflakes, tree branches, capillary and coral structures, etc.) (Ball, Phillip. Branches)

Cellular structures and atoms are the minutia of nature as far as we can comprehend. In design, the minutia is typography. If the media it exists within dictates grid layout, then so should typographic scale (Brown, Tim). Multiplying and/or dividing an aspect ratio by a given number will produce a harmonic scale related to that number as well as the environment it exists in. Leading should also be chosen based off of the developed harmonic scale. (Whited, Billy.Relational Design) Nothing is arbitrary in relational design. Owen Gregory writes about the relationship between the diatonic scale and layout in graphic design. Music, as illustrated in "The Power of Limits," follows the same system as much of nature. A single note wavelength falls within the Fibonacci sequence, and therefore the golden ratio. Subdivided into harmonies, we find different ratios emerge: the perfect 4th = 3:4, the 5th = 2:3 and the octave = 1:2 just to name a few (Doezi, György. Power of Limits). These harmonious wavelengths can create soothing tones or dissonance. By using one of these ratios as a compliment to the given ratio of the media size, the designer might create a similar experience, though visual, for the audience (Brown, Tim. More Perfect Typography). As molecules are the building blocks of the natural elements we see, so type is the building block of visual elements of layout. Designing for function should be content driven. If the design does not improve the efficiency of the content, it is unnecessary. The type-size and leading being dictated by the harmonic scale, character/word counts and readability are then dictated by the line-height, which then dictates the position of an element on the page (Whited, Billy. Relational Design) (Brown, Tim. More Perfect Typography). The use of a relational system can create an environment in which content exists in a harmonious balance, and therefore captures the audience as Robert Bringhurst states in "Elements of Typographic Style,"

"The page is a piece of paper. It is also a visible and tangible proportion, silently sounding the thoroughbass of the book. On it lies the text block, which must answer to the page. The two together – page and text block – produce an antiphonal geometry. That geometry alone can bond the reader to the book. Or conversely, it can put the reader to sleep, or put the reader's nerves on edge, or drive the reader away."

Sources:

Ball, Philip. (2009). Flow : Nature's Patterns : A Tapestry in Three Parts. Cary, NC, USA: Oxford University Press.



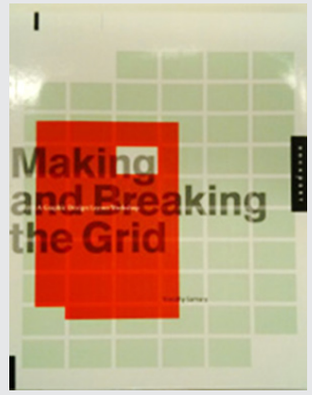
Ball, Philip. (2009). Branches : Nature's Patterns : A Tapestry in Three Parts. Cary, NC, USA: Oxford University Press.

Brown, Tim (Speaker). (2011). More Perfect Typography [Video] Available fromhttp://vimeo.com/17079380

Clayton, M., & Philo, R. (2010). Leonardo da Vinci: The mechanics of man. London : Los Angeles: Royal Collection Enterprises.

Doczi, György. (1909). The Power of Limits. Boulder, CO, USA: Shambhala Publications ; 1981.

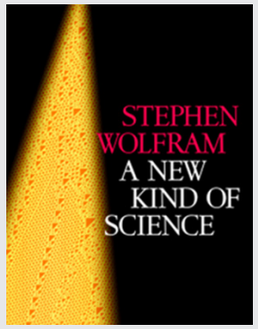
Gregory, O. (2011, December 9). Composing the New Canon [blog post]. Retrieved from http://24ways.org/2011/composing-the-new-canon/



Samara, Timothy. (2005). Making and Breaking the Grid. Rockport Publishers.

Waddington, C. H. (1966). The Modular Principle and Biological Form. Gyorgy Kepes, ed. New York: George Braziller.

Whited, B. (2011, October 28). Relational Design [Blog post]. Retrieved fromhttp://blog.8thlight.com/billy-whited/2011/10/28/r-a-ela-tional-design.html



Wolfram, Stephan. (1959 –). A New Kind of Science. Stephen Wolfram LLC.