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Another View: Art, Form and Physics

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Abstract. Through the evolution of my painting, I have created a world of color, form, texture, tone, and rhythm. The underlying foundation of my art is a geometric concept, I call Peden GridField Geometry (PGFG). This paper, in the spirit of this conference, will concentrate on some of the resulting forms and patterns of PGFG, and suggest some physical analogies to our own world.

1. Introduction

The basic concept of Peden GridField Geometry is given by equation

$$P_n = G\left[\sum_1^n \left\{\sum_1^v F^v\right\}_n\right], \tag{1}$$

where F is a wave field, and P_n is the resulting gridfield, which is the crossing of two or more wave fields.

Gridfield geometry is a process where each geometric configuration, P_n is dependent on the preceding geometric configuration, P_{n-1}: $P_n = f(P_{n-1})$. The first summation in Eq. (1), I view as a horizontal progression—a sequence of moments, which could be considered time $\Delta t = \phi\,(\Delta P)$, where each successive moment is dependent on the summation of the preceding moments. The second summation (between the braces), I view as a vertical summation of events that occur simultaneously and independent of each other, but still dependent on the preceding geometry, P_{n-1}. In other words, the first sum is a progression of moments, the second sum is the number of events per moment, and P_n is the sum of all histories. The time factor implies the dynamic and physical aspects of Peden GridField Geometry; that is, an organic growth of geometric configurations, which is the life and basis of my art and mathematics.

2. GridField Geometries

Two geometries are basic to PGFG—Common GridField Geometry (CGF) and Interphase GridField Geometry (IGF).

Common GridField Geometry is the crossing, or cross phasing, of two fields, where one field is a function of the other; more specifically, it is a curvilinear grid pattern formed using a primary *X* or *Y* field orientation with a secondary field being generated as a function of the primary field. For example, in Fig. 1, a *Y* oriented field was chosen as P_1; for the next term, P_2, a single *X* oriented field was chosen as a function of our *Y* field to get the common gridfield shown in Fig. 1b. The individual wave fields are dependent on wave length, amplitude, and wave shape. The wave shape can be sinusoidal, concave, linear, or a combination thereof. With these variables, an infinite number of gridfield configurations can be created. The "common" Cartesian grid is but one example.

Interphase GridField Geometry is where two fields are interweaving, i.e., interphasing, with each other. Interphasing occurs when a secondary phase track "reflects" off a primary track as seen in Fig. 2. The intersection of two tracks forms what I call an element. Two interphasing tracks form a node element; two cross phasing tracks form a common element (Fig. 2).

The common gridfield is used as the coordinate system onto which an interphase field is figured. For example, on the common gridfield, Fig. 1b, a third field with an *X* orientation is added, resulting in the interphase gridfield, P_3, seen in Fig. 1c. To get the more commonly recognized grid of two crossing fields—in this case, the last two fields in the progression, the other fields are graphically eliminated, giving the gridfield in Fig. 1d.

To proceed to P_4, a new coordinate system needs to be established; this is configured by what I call mock axes, and is denoted by X_m and Y_m (Fig. 1d). The origin of these axes can be at any line intersection; for esthetic reasons, I have chosen an intersection on a line of rotational symmetry. Once the mock axes are established, other fields can then be added. Figure 3 shows the addition of a mock *Y* field.

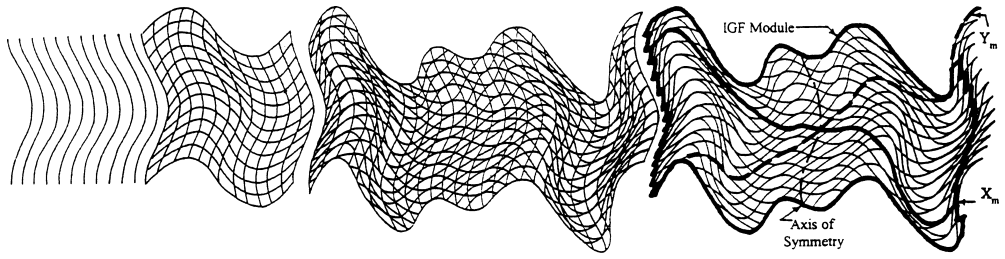


Fig. 1. (a) *Y* Field, (b) CGF, (c) Full ICF, (d) ICF Grid.

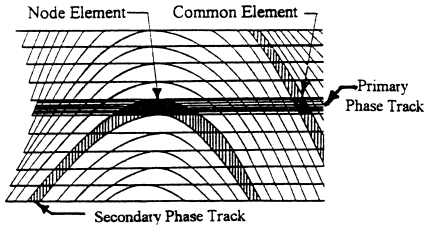


Fig. 2. GF Elements.

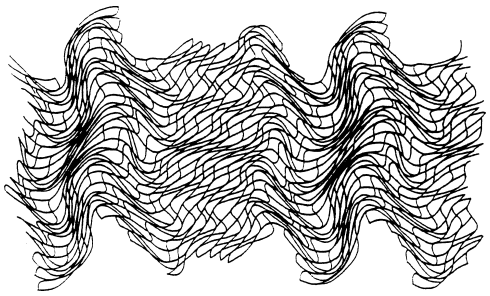


Fig. 3. Mock IGF Grid.

3. The Shape of Space

In my work, the geometry defines the space. The smallest divisions of this space are the elements. The individual wave patterns that form the elements, through cross phasing or interphasing, I view as analogous to the sub-atomic constituents of our microworld; the elements themselves as analogous to the atoms of our world. Further, any given gridfield configuration can be divided into a repeatable collection of individually different elements which I call a module (heavy outline in Fig. 1d)—analogous to the our molecule. This basic structure, the module of "my" world, as the molecule of "our" world, can be used to construct any number of shapes.

To demonstrate how a single shape changes in different geometric configurations, let's assume an imaginary character, Fig. 4a, existing in our Cartesian space, and translate it into some other geometric environments. It should be mentioned here that the shape was placed randomly in one of many possible regions of said space, and that the shape would be, to some degree, different in other locations. By taking a shape from our reality, our frame of reference, and putting it in a different geometric reality or frame of reference, squares can become circles, as in Fig. 4f, or any number of shapes, as per the other examples. In other words, the geometries are different manifestations of the same reality. In a sense, squares are still squares in these other "worlds", and would be seen as such by an observer in that environment, because his or her physiology would necessarily conform to the geometric laws of that space. The idea of shapes changing outside our frame of reference is not new if we consider Einstein's illustration of a clock approaching the speed of light: From our frame of reference, we see the clock being flattened and time slowing; but, from the clock's frame of reference, everything has remained normal. This poses the question, "What is 'true' shape?" The answer would obviously depend on our frame of reference; in gridfield space, it depends on the geometry of the space the object occupies. From an artist's point of view, it is interesting how the different geometries "express" the shapes in terms of energy. This can be seen in the energetic forms of Figs. 4b and 4d, the serene form of Fig. 4c, the lyrical wave "motion" of Fig. 4e, compared to the static rigidity of our Cartesian figure. Notice, also, the abrupt angularity of the shapes in a concave wave shape space, Fig. 4g, and in the linear space of Fig. 4h.

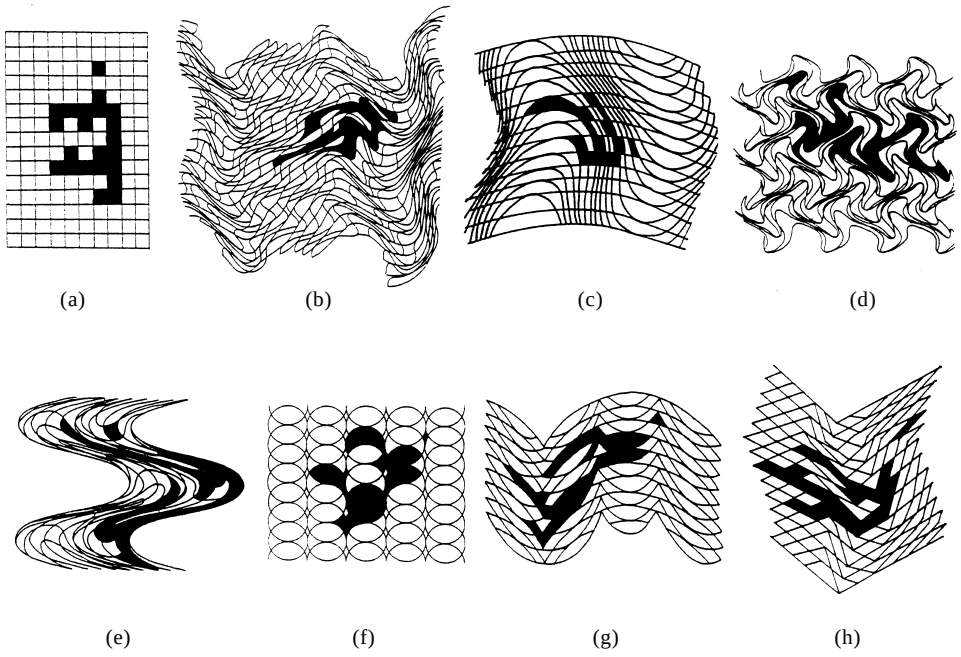
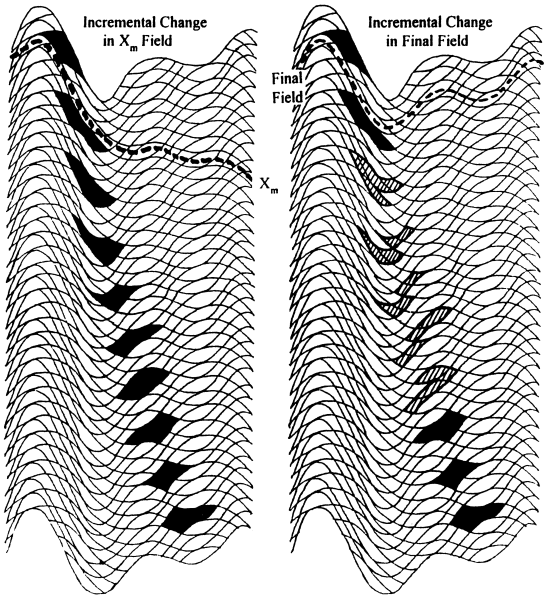


Fig. 4. Spatial Shape Changes. (b) Mock IGF, (c) IGF, (d) IGF, (e) CGF, (f) IGF, (g) IGF.

4. Movement in GridField Space—Shape Dynamics

So far, we have been studying static shapes placed in different spatial geometries. Let's now consider a shape actually moving in a gridfield space. A shape moving in our real world Cartesian/Newtonian space at "normal" speeds will maintain its dimensional and geometric integrity. A shape moving in a common gridfield space will distort to a greater or lesser degree depending on the configuration of the geometry it traverses; the relationship of the elements will remain the same. However, a shape moving in an interphase gridfield will not only distort, but fracture, and may, on an elemental level, fragment. For example, let's study the changing phases of a 4 element "square" as it moves through two different paths in an interphase gridfield situation: Figure 5a shows the shape incrementally moving along the X_{m} axis as it would move in a common gridfield. However, if it moves along the path of the final field, it behaves as shown in Fig. 5b, where it (cross hatched shapes) fractures at the critical nodal regions, and reforms as it traverses the field path. For large shapes, made of many elements, these stresses would be absorbed and seen as proportionally minor disturbances, fluctuations, or pulses.

What this suggests, analogous to our own world, is that some very strange things happen at the micro, or quantum, level—especially in the nodal regions of an interphase geometric space.



(a) (b)

Fig. 5.

5. Some Other Approaches to GridField Geometry

Let me briefly suggest some other variations of GridField Geometry: As mentioned in the introduction, the second sum of Eq. (1) accounts for events occurring simultaneously and independent of each other. Such a generation is seen in Fig. 6, where I have taken the gridfield of Fig. 1d and generated two fields, simultaneously, each in the *X* and *Y* mock axis direction.

Another approach is multi phase geometry. Grid geometry is generally two phase, i.e., the crossing of two fields. Assuming a three-phase geometry, i.e., the crossing of three fields, some interesting patterns occur. Three examples, each made of three equal fields at a 60° orientation from each other, but with a different phase relationship, are shown in Fig. 7. Though all these fields have a definite modular configuration, the field in Fig. 7c is the most distinctive in its hexagonal divisions, reminiscent of crystalline patterning, such as that of graphite.

Yet another extension is the application of PGFG to polar coordinate systems, giving various and provocative circular rhythms, as exemplified by the three interphase geometries in Fig. 8.

The last possibility I will suggest here is what I call a rotational geometry, where we have two or more fields rotated about a common origin by some angle relative to each other. Figure 9 demonstrates two like fields rotated at angles of 45° and 90° respectively, Figs. 9a and 9b.

Let me propose with Fig. 9b, an analogy with our own universe: It is my understanding that black holes are cosmic anomolies with an intensely curved geometry. If, in my example, the Cartesian/ Newtonian grid region were to represent our part of the universe, might not the nodal regions be equivalent to the black holes? This idea implies a geometrically configured universe with a predictable distribution of black holes.

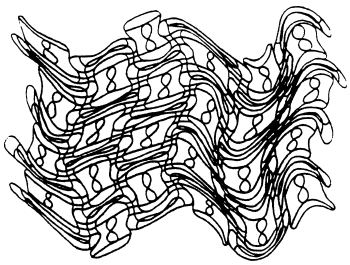
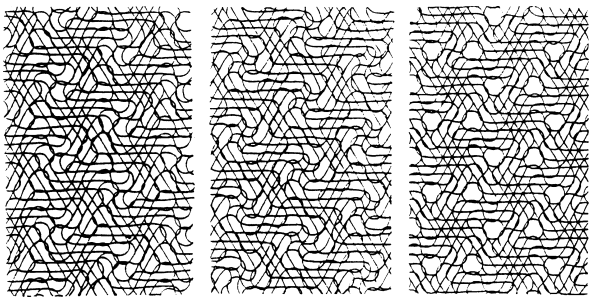
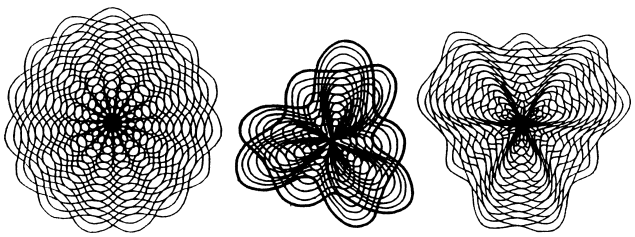


Fig. 6. Simultaneous Field Generation.



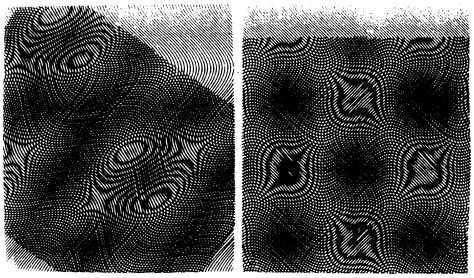
(a) (b) (c)

Fig. 7. Three Phase Field PGFG.



(a) (b) (c)

Fig. 8. Polar PGFG- 3 Examples.



(a) (b)

Fig. 9. Rotational PGFG.

6. Art and GridField Geometry

GridField Geometry offers the artist a new and infinitely variable approach to form and rhythmic possibilities. Expressing form in terms of rhythmic energy was demonstrated in Sec. 3, where various conditions of calm and excitement can be symbolized, if not emotionally expressed, through the static and dynamic qualities of the image. I personally use the geometry in such a manner by manipulating the shapes like a composer uses musical themes; that is, by taking them apart, putting them together, rotating them in space, and developing them in varied ways to engage the viewer and, perhaps, evoke some deeper emotional and/or intellectual meaning. I try to create an environment of color, tone, line, texture, rhythmic energy in which my shapes exist and interact, and, in essence, create an abstract narrative or metaphor. For example, in my painting "Come Together" (Fig. 10) there is at the left a distribution of distinctively separate elements, which progressing to the right through various color and rhythmic configurations, come together in the conclusion of a single shape. This could be interpreted as a metaphor for this conference; that is, a gathering of individuals and disciplines to achieve a common bond. Individual meaning, of course, would necessarily come out of the viewer's own mood and experience.

The visual dynamics of this painting may also remind one of the familiar wave and flow patterns seen in lakes and streams, as well as the complex patterns of turbulence in liquids and gases. This suggests the possibility of using PGFG in the interpretation and/or study of flow dynamics.

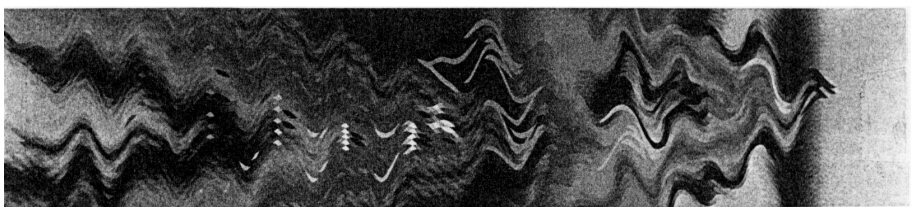


Fig. 10. "Come Together" by D. Peden.

7. Conclusion

The scope of what I have presented is limitless; I hope that it will not only show the reader another view, but indicate that there are other views that will lead to new forms, patterns, and thought. I do not believe for a moment that geometry is dead—there is much more to be discovered.

Throughout this paper I have made some analogies of PGFG with our own world. Let me conclude with one more. As I understand it, most scientists suggest that mass and/or quantum systems define their own geometries. From the experience of my own science fiction world, I propose, for the sake of argument, we turn this around and say that geometry defines mass and its dynamics. Mass becomes an illusion which is given solidity through our senses in order to separate and define objects and events; thereby, giving us a measurable, rational, human reality.