# *The Human Social Experience Forms a Fractal*

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**R.N. Elliott's Discovery**

In the 1930s, Ralph Nelson Elliott discovered that aggregate stock market prices trend and reverse in recognizable patterns. In a series of books and articles published from 1938 to 1946,[1] he described the stock market as a fractal. A fractal is an object that is similarly shaped at different scales.

Although Elliott came to his conclusions fifty years before the new science of fractals blossomed, he took a step that current observers of natural processes have yet to take. He explained not only that the progress of the market was fractal in nature but discovered and described the component patterns. The patterns that Elliott discerned are repetitive in *form* but not necessarily in time or amplitude. Elliott isolated and defined a number of patterns, or "waves," that recur in market price data. He named and illustrated the patterns. He then described how they link together to form larger versions of themselves, how they in turn link to form the same patterns at the next larger size, and so on, producing a structured progression. He called this phenomenon The Wave Principle.

Many areas of mass human activity display the Wave Principle, but it is most popularly applied to stock market averages. There is voluminous, meticulously tabulated data on financial markets because people deem them important. Actually, the stock market is far more significant to the human condition than it appears to casual observers and even to those who make their living by it. The level of aggregate stock prices is a direct and immediate measure of the popular valuation of a society's total productive capability. That this valuation has a *form* is a fact of profound implications that should ultimately revolutionize the social sciences.

**The Stock Market as a Robust Fractal**

A classic example of a *self-identical* fractal is nested squares. One square is surrounded by eight squares of the same size, which forms a larger square, which is surrounded by eight squares of that larger size, and so on.

A classic example of an *indefinite* fractal is the line that delineates a seacoast. When viewed from space, a seacoast has certain irregularity of contour. If we were to drop to ten miles above the earth, we would see only a portion of the seacoast, but the irregularity of contour of that portion would resemble that of the whole. From a hundred feet up in a balloon, the same thing would be true.

Scientists today recognize financial markets' price records as fractals, but they presume them to be of the indefinite variety. Elliott undertook a meticulous investigation of financial market behavior and found something different. He described the record of stock market prices as a *specifically patterned* fractal yet with *variations* in its quantitative expression. I call this type of fractal — which has properties of both self-identical and indefinite fractals — a *robust* fractal. Robust fractals permeate life forms. Trees, for example, are branching robust fractals, as are animals' circulatory systems, bronchial systems and nervous systems. The stock market record belongs in the category of life forms since it is a product of human social interaction.

**How Is the Stock Market Patterned?**

Figure 1 shows Elliott's idea of how the stock market is patterned. If you study this depiction, you will see that each component, or "wave," within the overall structure subdivides in a specific way by one simple rule: If the wave is heading in the *same* direction as the wave of one larger degree, then it subdivides into *five* waves. If the wave is heading in the *opposite* direction as the wave of one larger degree, then it subdivides into *three* waves (or a variation). These are called motive and corrective waves, respectively. Each of these waves adheres to specific traits and tendencies of construction, as described in *Elliott Wave Principle* (1978).

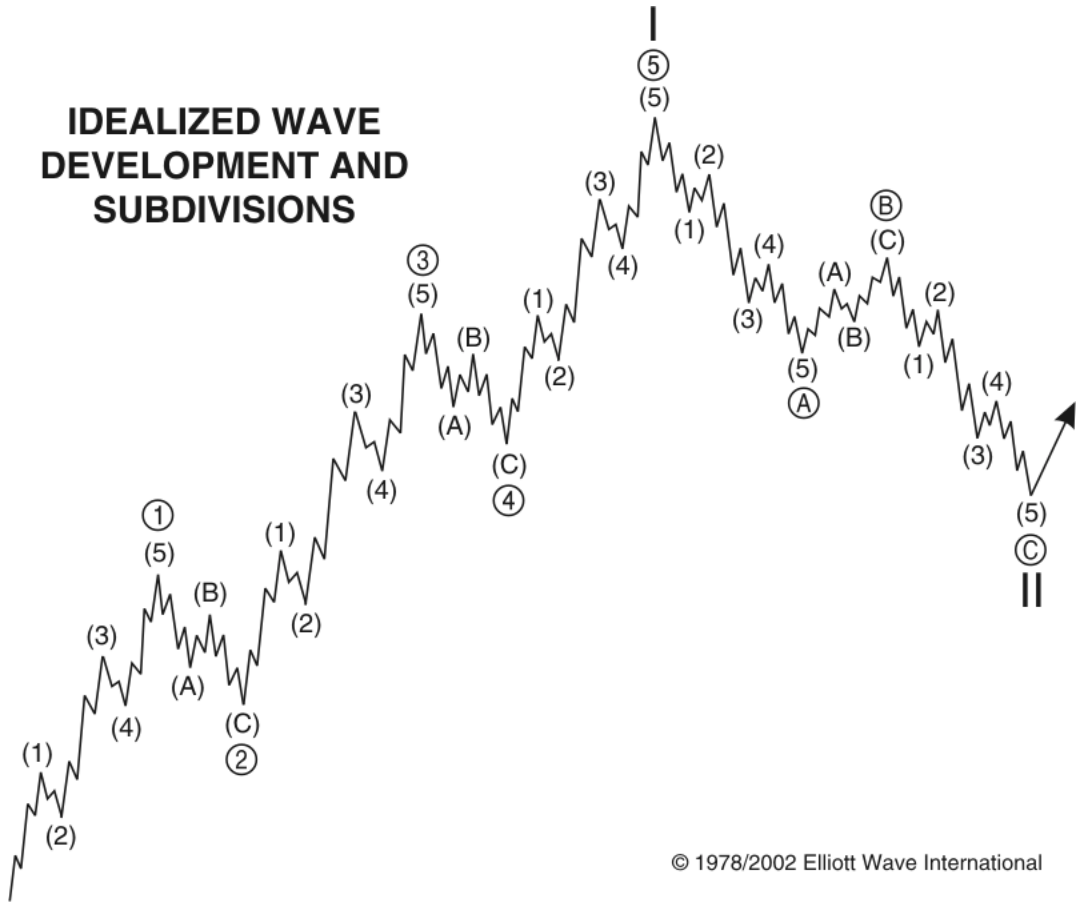



*Figure 1*

Waves subdivide this way down to the smallest observable scale, and the entire process continues to develop larger and larger waves as time progresses. Each wave's degree may be identified numerically by relative size on a sort of social Richter scale.

Literature on the Wave Principle[2] describes aspects of waves that are rigid and those that may vary. Figure 2 shows a rising wave in a manner more consistent with Elliott's detailed observations about typical real-world development. Observe, for example, that waves 2 and 4 in each case take a slightly different shape.


*Figure 2*

The further time extends, the larger the degrees of trend get, implying a geometric expansion in the size of the advances and retrenchments that form humanity's progress, the entire structure propelled by the ebb and flow of mass mood. Figure 3 conveys this idea visually with a spiraling line connecting the top of each first wave of increasingly higher degree. While forms such as triangles, squares and circles (and concepts such as "cycles" in markets or human experience) imply stasis or precise repetition, a spiral implies net growth or decay, expansion or contraction. The largest degree depicted in the illustration, of course, would be the first wave up of the *next* larger degree, and so on.

Understanding how the market progresses at all degrees of trend gives you an invaluable perspective. No longer do you have to sift through the latest economic data as if they were tea leaves. You gain a condensed view of the whole panorama of essential trends in human social mood and activity, as far back as the data can take you.

**The Necessity and Efficiency of "5-3"**

The Wave Principle reveals that the human social experience follows a form that derives from the tension between the opposing dualities of progress and regress. Elliott himself never speculated on why the market's essential form was five waves to progress and three waves to regress. He simply noted that it was happening. Does the essential form have to be five waves and three waves? I think so.

First, were there no fluctuation, there would be no progress. A steadily increasing trend of 3% per year, for instance, would be stasis; nothing would ever change. Fluctuation in a net sideways trend, i.e., one with no net change, would also be stasis. Progress must include setbacks *and* net change over time. From the point of view of a participant, *punctuated* progress is the only kind of progress that is possible to perceive.

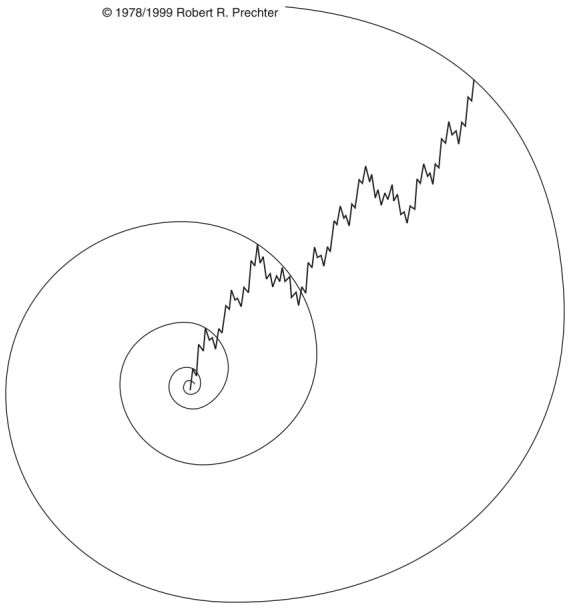



*Figure 3*

Second, the 5-3 pattern is *the* minimum requirement for, and therefore the most efficient method of, achieving both *fluctuation* and *progress* in linear movement when the only constraint is that the odd-numbered waves of each degree be longer with respect to the Y axis than the even-numbered ones. One wave does not allow fluctuation. The fewest subdivisions to create fluctuation is three waves. Three waves in both directions do not allow progress. To progress in one direction despite fluctuation, movements in the main trend must be at least five waves, simply to cover more ground than the three waves. While there could be more waves than that, the most efficient form of punctuated progress is 5-3, and nature typically follows the most efficient path.

**Examples of the Basic Pattern from the Lowest Extreme of Available Data Duration to the Highest**

Elliott pointed out that the 5-3 fluctuation is manifest at all degrees of trend. Figures 4 through 10 illustrate this observation with real-life examples. The shortest duration of available data is that which shows every single price change in a financial index. Such changes sometimes register in less than a second and are called "ticks." Figure 4 shows a "tick" graph from October 6, 1997. Figure 5 shows an hourly graph from September 1997. Figure 6 is a daily graph from 1962. Figure 7 is a weekly graph from 1974-1975. Figure 8 is a monthly graph from 1932 to 1942. Figure 9 is a yearly graph from 1929 to the present. Figure 10 is a decade-by-decade graph from 1700 to the present. There are no data prior to 1690. All these plots show similar patterns of movement despite a difference in time span of over 30 million to 1. The declining portions of the cycles depicted in Figures 9 and 10 have just begun unfolding, but to date the pattern is following the same form as the smaller-degree plots.

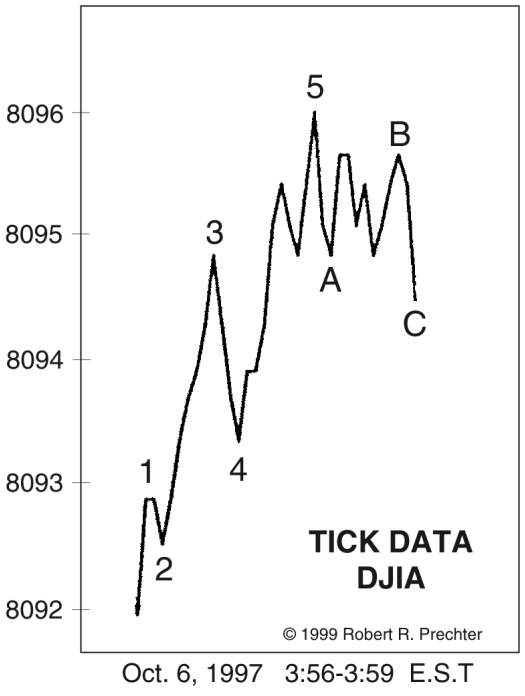



*Figure 4*

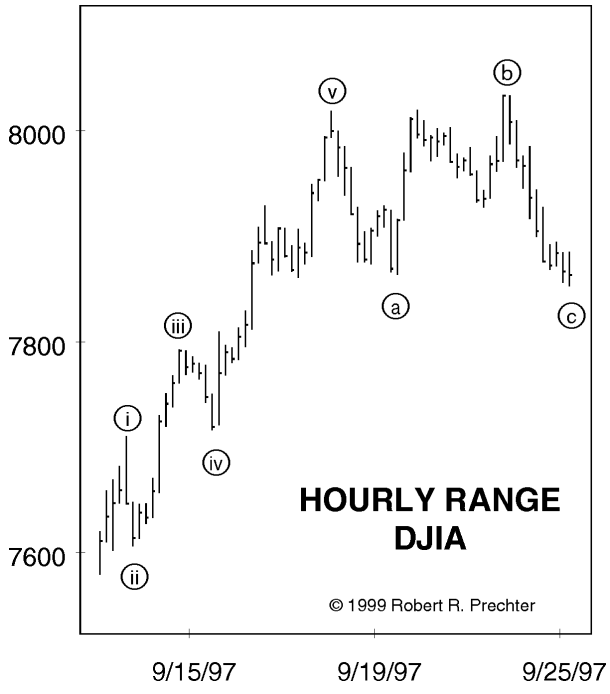



*Figure 5*

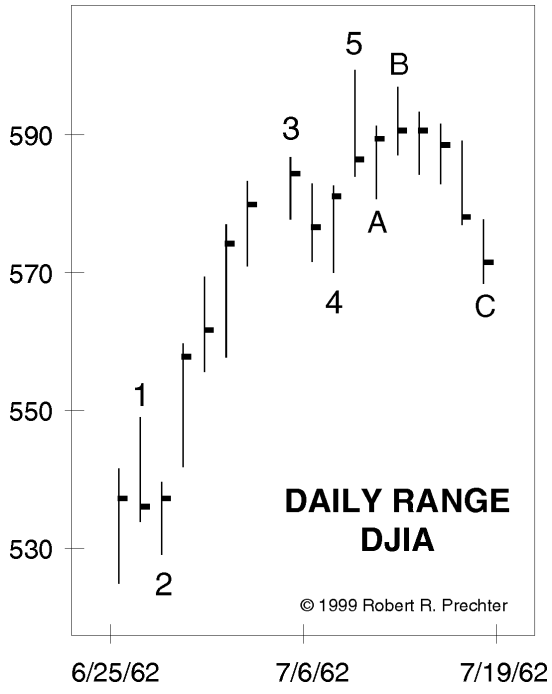



*Figure 6*

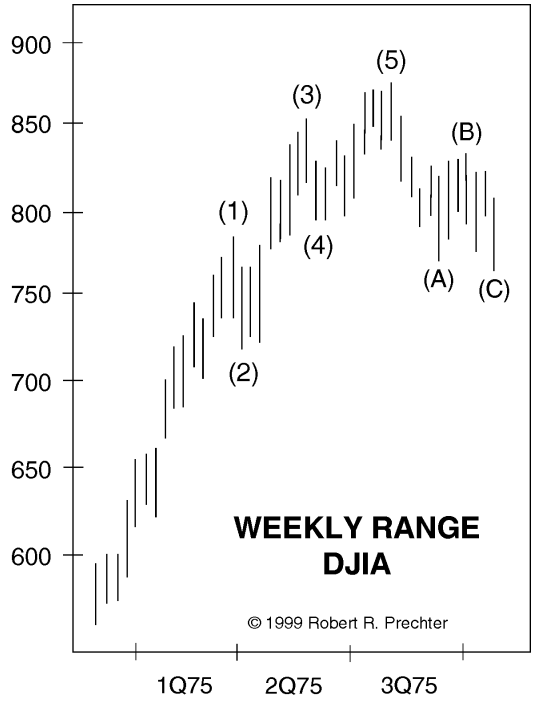



*Figure 7*

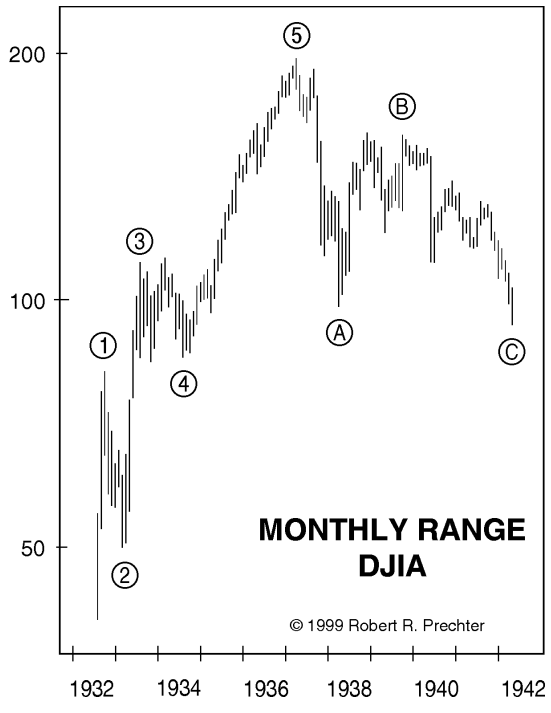



*Figure 8*

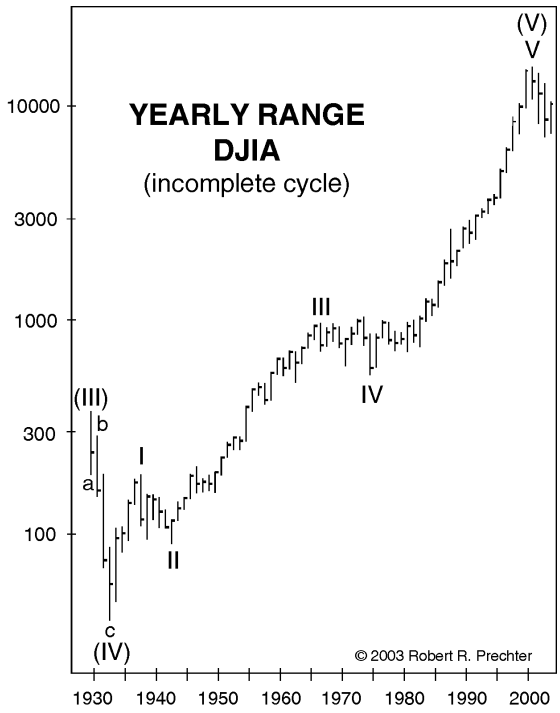



*Figure 9*

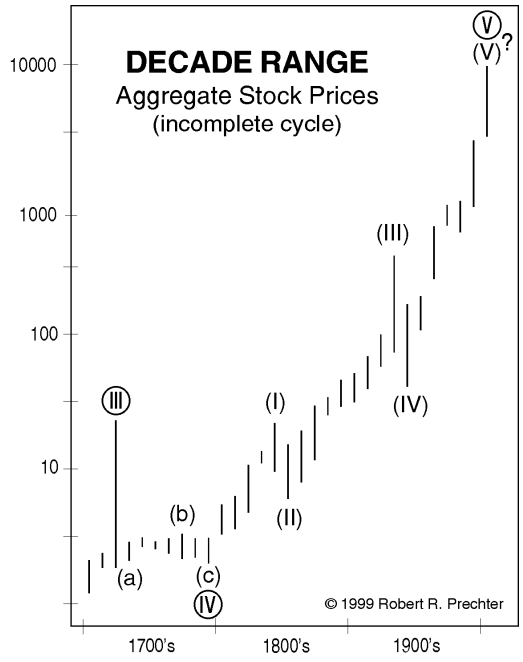



*Figure 10*

**Examples of Real-World Long-Term Waves**

Figures 11 through 14 display advancing long-term waves in various financial markets. As you can see, they all sport five waves up. These five-wave patterns proceeded relentlessly, ignoring news of every imaginable variety, including Prohibition, a crash in Florida land values, Roosevelt's seizure of Americans' gold, Hitler's rise to power and the end of the Vietnam war.

## SAMPLE ELLIOTT WAVES

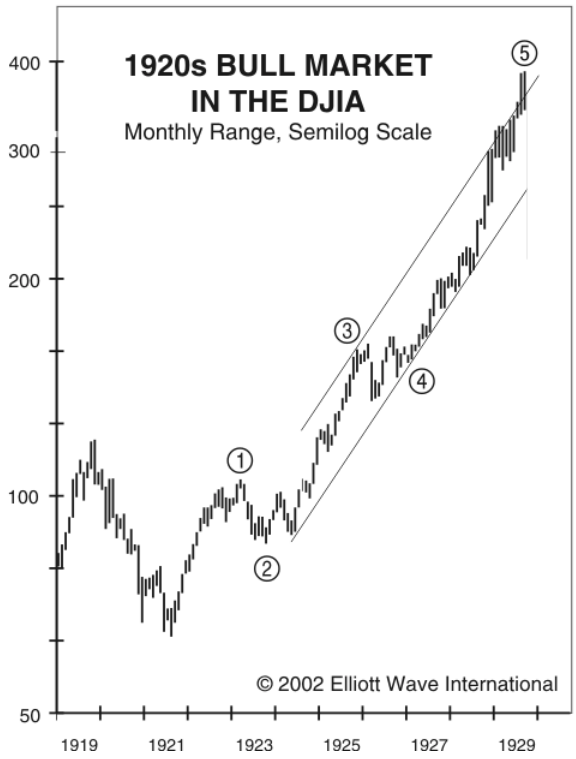



*Figure 11*

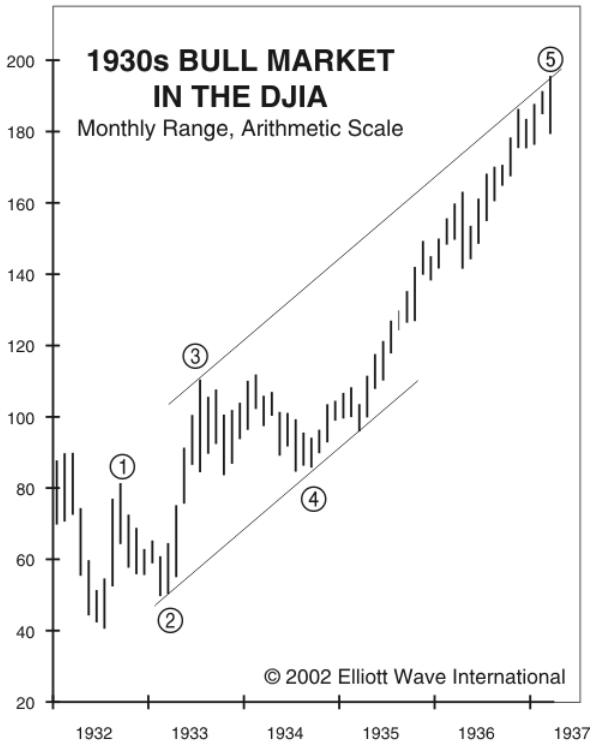



*Figure 12*

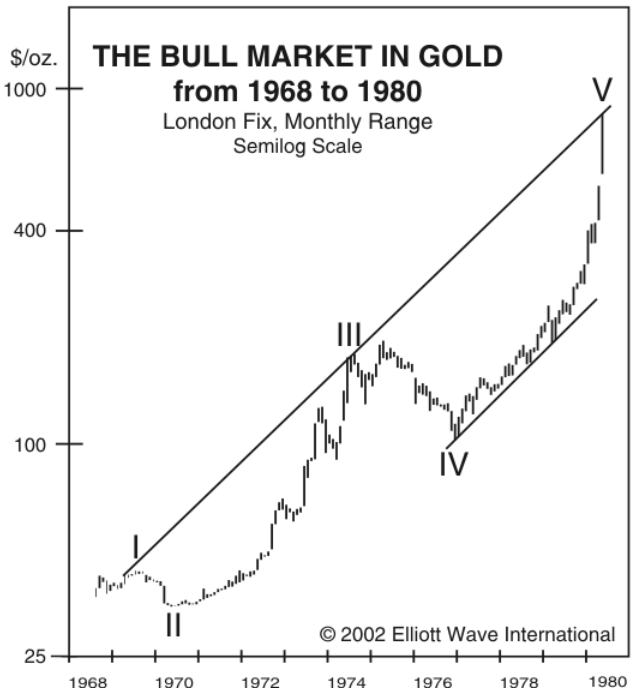



*Figure 13*

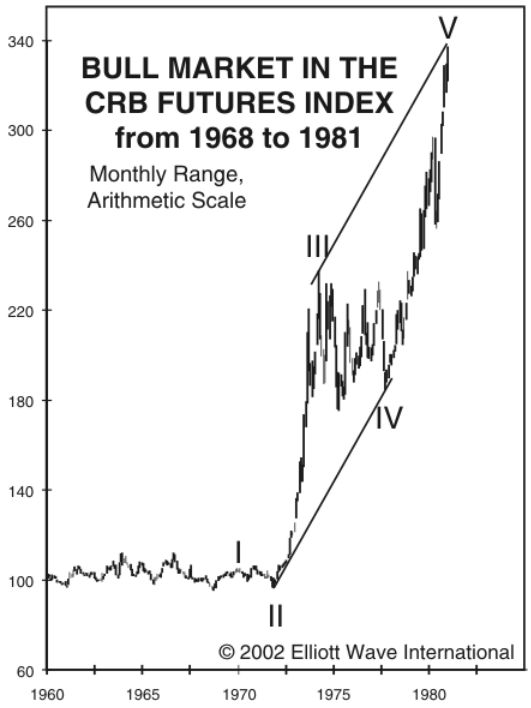



*Figure 14*

I have chosen these examples because they display one of Elliott's guidelines of wave formation, which is that bull market waves often end after reaching the upper parallel line of a trend channel. In most cases, the market creates channels in which the lower line touches the bottom of waves 2 and 4, while the upper line touches the top of wave 3 and, later, wave 5.

**A Quiz**

OK, now you try it. Figure 15 shows an actual price record. Does this record depict two, three, four or five completed waves? Based on your answer, what would you call for next?

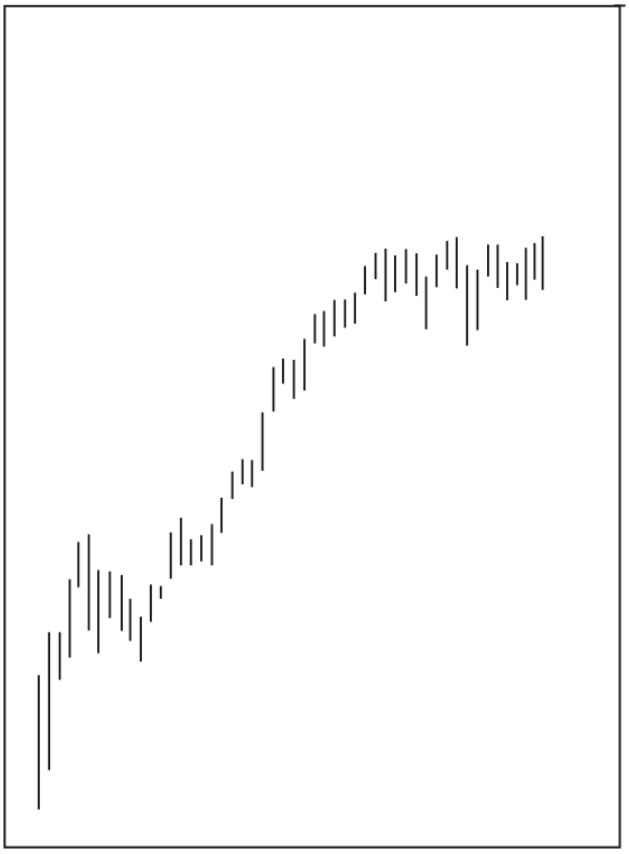


*Figure 15*

Let's compare your answer with mine. From the simple idea that a bull market comprises five waves, *The Elliott Wave Theorist* in September 1982 called for the Dow to quintuple to nearly 4000 and on October 6 announced, "Super bull market underway!" The November 8 issue then graphed the forecast for the expected fifth wave up, as you can see in Figure 16.

**"Surveying all the market's action over the past 200 years, it is comforting to know exactly where you are in the wave count."**

— *The Elliott Wave Theorist*, November 8, 1982

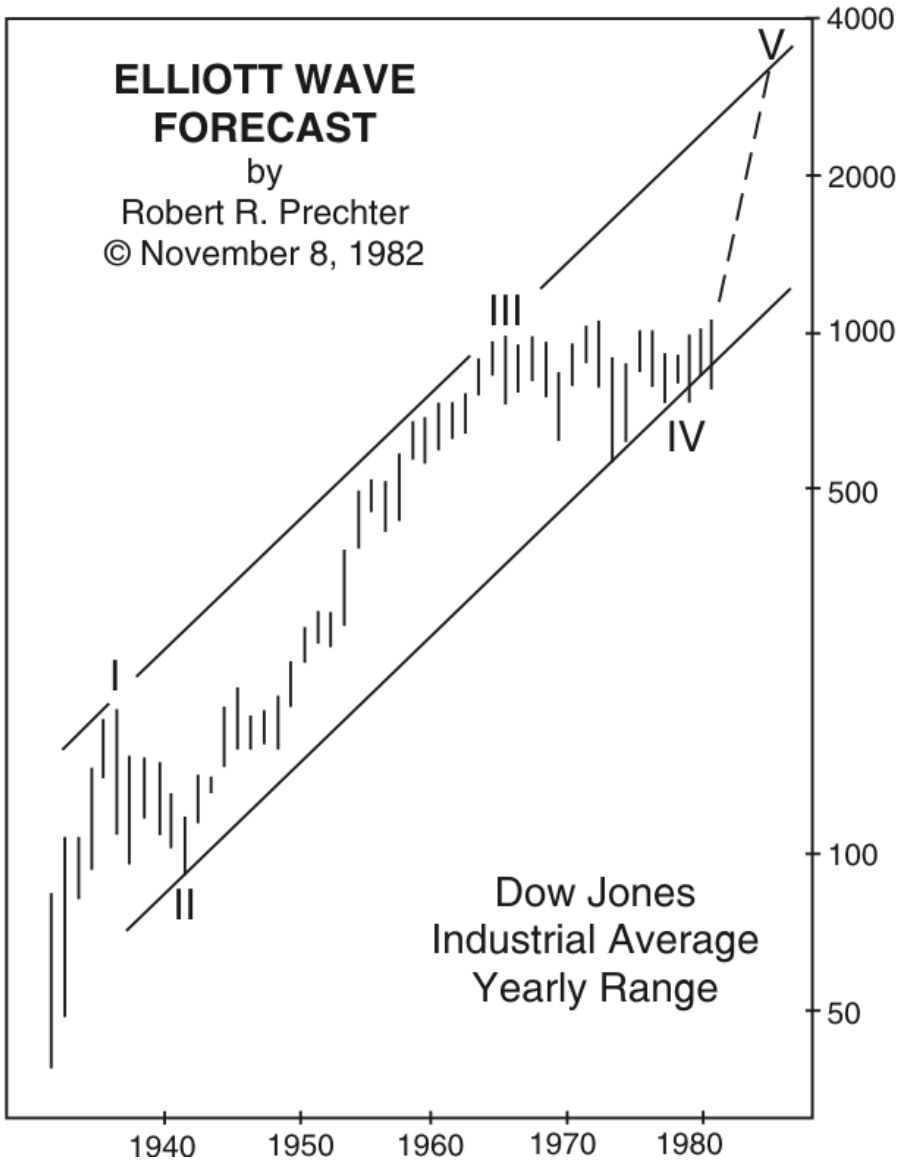


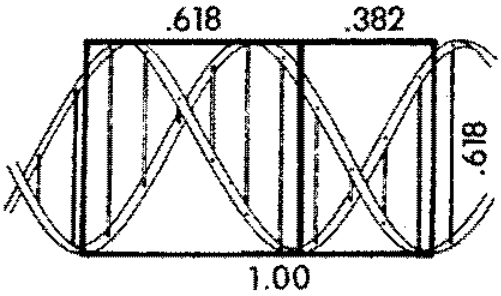

*Figure 16*

I have kept this example as simple as possible. To view the detailed labeling and real-time analysis that fully justified the prediction made in Figure 16, please see the discussions attending the Appendix and Figures 5-5 and 8-3 in *Elliott Wave Principle*.

As you can see, Elliott waves are clear not only in retrospect. They are often — particularly at turning points — quite clear in prospect. I could fill many pages describing other triumphs (and failures) of applying the Wave Principle, but I hope this one example conveys its occasionally immense value for forecasting.

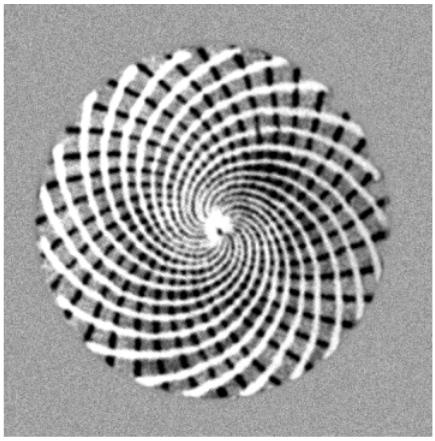
**The Fibonacci Sequence in the Wave Principle**

The Fibonacci sequence[3] is 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, and so on. It begins with the number 1, and each new term from there is the sum of the previous two. The limit ratio between the terms is .618034..., an irrational number variously called the "golden mean" and "divine proportion" but in this century more succinctly *phi* (f) after the architect Phidias, who designed the Parthenon. Both the Fibonacci sequence and the Fibonacci ratio appear ubiquitously in natural forms ranging from the geometry of the DNA molecule to the physiology of plants and animals, as shown in Figures 17 through 19.[4] So what does this information have to do with the stock market?




*Fibonacci in DNA*

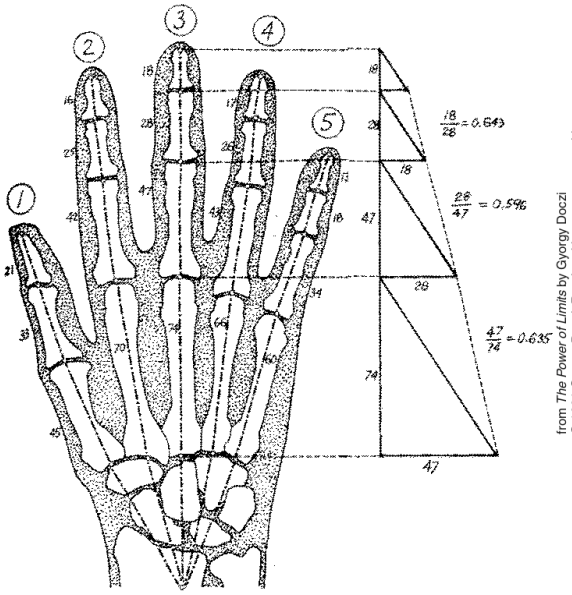
*Figure 17*



*A Spiraled Flower*
*This diagram reveals the double spiraling of the daisy head. Two opposite sets of rotating spirals are formed by the arrangement of the individual florets in the head. They are also near-perfect equiangular spirals. There are 21 in the clockwise direction and 34 counterclockwise. This 21:34 ratio is composed of two adjacent terms in the mysterious Fibonacci sequence.*

from Bergamini, David and the editors of *Life.* (1963) *Mathematics.* New York: Time-Life Books.

*Figure 18*




from *The Power of Limits* by Gyorgy Doczi
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*Fibonacci subdivisions in the hand*

*Figure 19*

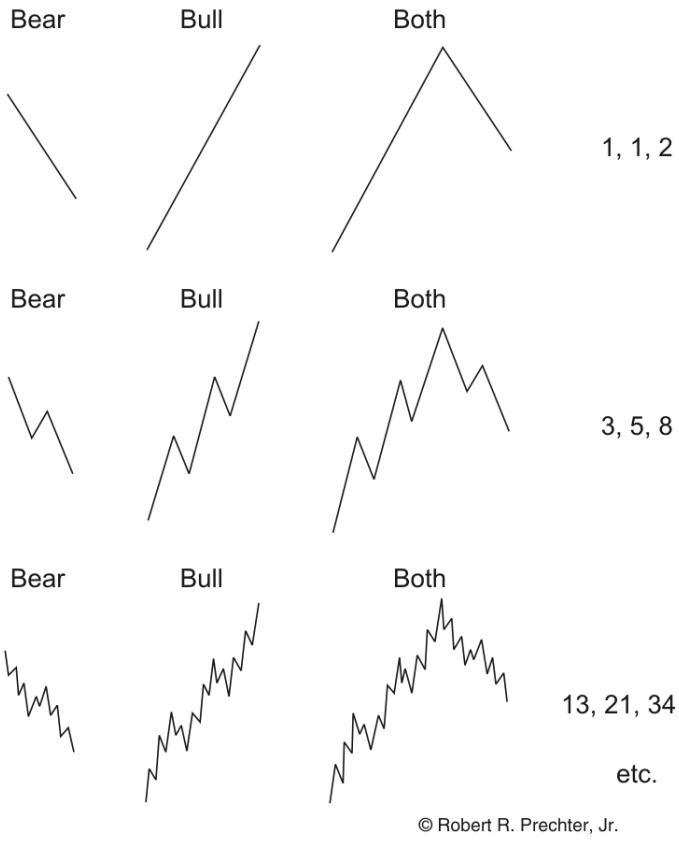


*Figure 20*

As Elliott explained in his final unifying conclusion, the Fibonacci sequence governs the number of waves which form in the movement of aggregate stock prices, in an expansion upon the underlying 5:3 relationship. Figure 20 shows the progression. The simplest expression of a corrective wave is a straight-line decline. The simplest expression of a motive wave is a straight-line advance. A complete cycle is two lines. At the next degree of complexity, the corresponding numbers are 3, 5 and 8. This sequence continues to infinity.

Thus, the form of the valuation of mankind's productive enterprise (via the stock market) through history follows a progression/regression pattern that is typical of processes in nature that display patterned growth. In its broadest sense, then, the Wave Principle communicates the idea that the same mathematical relationships that shape many aspects of living creatures is inherent in the mentation and activities of aggregated human beings.

In the past few years, science has taken a quantum leap in knowledge concerning the universal appearance and fundamental importance of Fibonacci mathematics. Chapters 10, 11, 12 and 21 of *The Wave Principle of Human Social Behavior* explore the wider scope of this new knowledge and its implications.

**Why Is the Stock Market Patterned? — The Herding Impulse**

For years, some theoreticians have argued that stock price movements are random because all investors make fully informed and rational decisions, those who study the market and its participants know that few investment and trading decisions are based on reason, logic and knowledge gained from comprehensive research. Some decision-making is informed and rational, but most apparently reasonable explanations for investors' decisions are merely *rationalizations* of emotionally based decisions.

For the most part, consumers judge prices for bread and shoes consciously and reasonably according to their needs and means. When human beings value financial assets, they must contend with a debilitating lack of knowledge and feelings of uncertainty. They contend with these obstacles to a great degree by forming judgments in sympathy with or in reaction to the opinions and behavior of others. This surrender of responsibility makes them participants in a collective, which is not a reasoning entity. The fact that price changes are patterned proves that the collective's net valuations are not reasoned, but it also shows that they are not random, either. The remaining option is that they are unconsciously determined. Indeed, shared mood trends and collective behavior appear to derive

from a herding impulse governed by the phylogenetically ancient, pre-reasoning portions of the brain. This emotionally charged mental drive developed through evolution to help animals survive, but it is maladaptive to forming successful expectations concerning future financial valuation.

Social mood change does not necessarily affect every individual involved, but in the aggregate, the people participating in markets act as a crowd. An early observer of crowd psychology once made the observation that a very rational and sensible human being, when part of a crowd, becomes a "blockhead." To be more precise, he ceases to think independently and reasonably. Wall Street is certainly a crowd. Every day, investors read the same newspapers, listen to the same TV shows and watch the same market indices go up and down. Millions of people involved in the market watch and hear all the same things. It is almost as if the participants are on a town square, and an orator trying to whip up revolution is standing on a balcony, making the crowd's emotions wax and wane with each change in content, tone and volume. In the case of markets, however, the orator and crowd are usually one and the same. Much of Wall Street's information (such as price level, direction, speed of price change and volume) is self generated, and, just like a crowd, Wall Street feeds off its own frenzies. (This process involves the feedback of result back into the system as a new cause, making it a candidate for study under chaos theory.) Because crowds have a nature all their own and a behavioral style that reflects it, mass emotional change has a fair degree of predictability.

The Wave Principle reveals that aggregate stock price movement, and therefore mass emotional change, is patterned *independently from concurrent news*. Thus, social mood and changes in it must simply be a reflection of the workings of human nature in society. The determinants of the specifics of market action are the naturally occurring direction, speed and extent of social mood changes. The only way for an individual to temper the consequences of the herding impulse and to gain independence from it is to understand that it exists.

**Elliott's Place in History**

In 1689, Jakob and Johan Bernoulli were able to "discern the minute in infinity" in a mathematical progression that foreshadowed the discovery of the fractal geometry of nature.[5] Perhaps the first person specifically to advance the idea of self-similarity at different scales in natural forms was the German poet and naturalist, Johann Wolfgang von Goethe, who in 1790 described the self-similarity of parts to the whole of plants.[6] A century later, from 1874 to 1897, mathematician Georg Cantor studied self-similar sets as mathematical phenomena.[7,8] In 1919, Felix Hausdorff invented the idea of fractional dimensions to describe the plane- or space-filling property of complex fractals.[9]

It is quite certain, since he was careful to name sources that inspired his later ideas, that Elliott never studied Bernoulli, Goethe, Cantor or Hausdorff, so it is acceptable to say that in the 1930s, R.N. Elliott independently rediscovered the very fundamental idea of self-similarity at different scales and related it to natural phenomena. Elliott was unquestionably the first person to describe self-affinity as a fundamental property of social phenomena and to recognize its implication for social causality. Here is some of Elliott's commentary that introduced these revolutionary ideas:

> Extensive research in connection with what may be termed human activities indicates that practically all developments which result from our social-economic processes follow a law that causes them to repeat themselves in similar and constantly recurring serials of waves or impulses of definite number and pattern. It is likewise indicated that in their intensity, these waves or impulses bear a consistent relation to one another and to the passage of time.

> The expression "human activities" includes such items as stock prices, bond prices, patent (application)s, [the] price of gold, population, movements of citizens from cities to farms and vice versa, commodities prices, government expenditures, production, life insurance [purchases], electric power produced, gasoline consumption, fire losses, price of seats on the stock exchange, epidemics, and real estate, business, politics [and] the pursuit of pleasure.[10] It is particularly evident in those free markets where public participation in price movements is extensive.
>
> Those who have attempted to deal with the market's movements have failed to recognize the extent to which the market is a psychological phenomenon. They have not grasped the fact that there is regularity underlying the fluctuations of the market, or, stated otherwise, that price movements in stocks are subject to rhythms, or an ordered sequence. The wild, senseless and apparently uncontrollable changes in prices from year to year, from month to month, or from day to day, link themselves into a law-abiding rhythmic pattern of waves. The same rules apply to the price of stocks, bonds, grains, cotton, coffee and all the other activities previously mentioned.
>
> The student should recognize that there are cycles within cycles. Major waves subdivide into intermediate waves[, which] subdivide into minor waves. One cycle becomes but the starting point of another, or larger, movement that itself is a part of, and subject to the same law as, the lesser movement. This fundamental law cannot be subverted or set aside by statutes or restrictions. Current news and political developments are of only incidental importance, soon forgotten; their presumed influence on market trends is not as weighty as is commonly believed. Underlying this progression, in whatever field, is a fixed and controlling principle, or the master rule under which nature works. This treatise has made use of price movements in stocks to illustrate the phenomenon, but all the principles laid down herein are equally applicable to the wave movement in every field where human endeavor is registered.[11]

Elliott thus introduced the idea that fractal self-affinity governs the human social experience and is fundamental to nature. His pioneering observations have led to the new science of socionomics, which explores the implications of the Wave Principle in terms of social-trend and social-event causality. This work, I believe, will ultimately effect a long overdue revolution in the practice of social science.

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**Author Bio**

Robert R. Prechter, Jr., is President of Elliott Wave International, Inc. and founder of the Socionomics Institute (www.socionomics.org). He has authored 12 books. His latest title is *Socionomics: The Science of History and Social Prediction* (2003).

**NOTES**

1 Elliott, Ralph Nelson. (1938). *The Wave Principle*. (1939) Articles in *Financial World* magazine. (1946) *Nature's Law*. Republished: (1980/1994). *R.N. Elliott's Masterworks — The Definitive Collection*. Prechter, Jr., Robert Rougelot. (Ed.). Gainesville, GA: New Classics Library.

2 Frost, Alfred John, and Robert Rougelot Prechter, Jr. (1978/1998). *Elliott Wave Principle — Key to Market Behavior*. Gainesville, GA: New Classics Library. Also, Prechter, R. (1999) *The Wave Principle of Human Social Behavior*. Gainesville, GA: New Classics Library.

3 The sequence is named for the famous 13th century Pisan mathematician, Leonardo, son of Bonacci, or Fibonacci for short. You can find a pretty good treatise on Fibonacci in Chapter 3 of *Elliott Wave Principle*.

4 See *The Wave Principle of Human Social Behavior* for more examples.

5 Dunham, William. (1990). *Journey through genius: the great theorems of mathematics*. New York: John Wiley & Sons.

6 Goethe, J.W. (1790). "On the metamorphosis of plants."

7 Dauben, Joseph W. (1990). *Georg Cantor: His Mathematics and Philosophy of the Infinite*. Princeton University Press.

8 For more on the pioneers in fractals, see *Classics on Fractals*. G.A. Edgar, ed. (1993), Addison-Wesley, Reading MA.

9 Hausdorff, Felix. (1919). "Dimension und äusseres mass." *Mathematische Annalen*, 79, pp. 157-179.

10 Elliott showed graphs of most of these activities in *The Wave Principle* (1938).

11 These sentences are collected from pp. 92, 147, 157, 183, 192, 217, 218, 228, 229 of *R.N. Elliott's Masterworks — The Definitive Collection* (1994). I have omitted ellipses and one-letter brackets for reading clarity.