

# **An urgent scientific parable from the God of humans?**

Carlos E. Puente

Oxford, September 2007

**Cover.** I like to thank Margaret Yee and all of you for the opportunity to read this paper here.

**Page 2.** Eighteen years ago and after an epiphany that changed my life, I fell in love with Scripture. As I read the Bible with the mind of a geophysicist with expertise in complexity, I started to notice commonalities between science and the revealed word and I started to pay attention to mysterious symbols such as the fig tree.

As you know, the fig tree appears first in the Bible in the story of Adam and Eve, as they covered their nakedness with fig leaves. In the Old Testament, such a tree is a consistent symbol of the people of Israel together with the vine, and such is seen, for instance, in the healing of Hezekiah via a poultice of figs.

In the New Testament the fig tree is found prominently in Nathanael being seen under the tree and such causing a surprisingly immediate response; in the parable of the barren fig tree that is given yet another year to produce fruit; in the seemingly out of character cursing of a fig tree by Jesus during his last week; and in the eschatological lesson of the fig tree that announces Jesus' return.

**Page 3.** Four years later and as I attended a meeting in lovely Montreal, there were several folks in the audience with German last names and such prompted asking my first graduate student, by then a professor himself, if such had meanings. That is how I learned that Einstein meant one stone, that goldstein was a stone of gold, that bierkens, my own student, meant cans of beer, that Mandelbrot, the celebrated father of fractals, was almond bread, and that feigenbaum meant fig tree.

When I heard fig tree I exclaimed **Oh my God!** for at that instant, like in a trance, I understood that **chaos theory** and Scripture were talking about the same things. The aim of this brief talk is to show you why I believe this is so.

**Page 4.** As you surely know, the famous **diagram of bifurcations** on the left, and shaped as a **tree** if we rotate it 90 degrees, is one of the main icons of chaos theory. Such summarizes the incredible behavior found while iterating the simple **logistic** parabola,  $X_{k+1} = \alpha X_k(1 - X_k)$ , shown on the right, when the parameter alpha is varied from 0 to 4.

Varying alpha has profound implications. When alpha is between 0 and 1, the parabola is below the **one to one** line and the dynamics converge to a value  $X_\infty$  equal to **zero**, that is, to the **origin**. When alpha is between 1 and 3, as shown on the right,  $X_\infty$  is positive and corresponds to the non-zero intersection between the parabola and the straight line.

As alpha is increased beyond 3, the dynamics settle into **oscillations**, first every two generations, then every four, then every eight, and so on in a chain of **bifurcations**, that encompasses all powers of 2. All these happen very quickly, up to a value  $\alpha_\infty$  that is much less than the maximum value of 4.

When alpha exceeds  $\alpha_\infty$ , there are sometimes **periodic** repetitions, as in the most prominent gap on the left every three generations, and, more commonly, non-repetitive behaviors and subject to extreme variation in initial conditions. These later ones are the well named aperiodic **strange attractors** that describe the wandering forever of **chaotic** behavior, and which, by not containing all possible points, have the topological structure of **dust**.

Quite notably, the diagram contains periodic behavior that encompass all natural numbers. Such is named the **Feigenbaum tree**

in honor of Mitchell Feigenbaum who first proved in 1978 that the **openings** and **durations** of the bifurcations happen in an **orderly** and **universal** fashion.

**Page 5.** Feigenbaum's results are indeed **universal**, for such are valid for countless equations that give rise to other chaotic trees. The iterations of unimodal functions, that is, those with one peak, as the ones depicted here left and right and related to the shown equations, always yield, by increasing the parameter alpha, a straight root, a "tender branch," bifurcation branches, and, in an intertwined fashion, periodic branches and the dusty foliage of chaos, that then corresponds to "fig leaves." In all cases, the openings and durations of bifurcations happen precisely at the speeds obtained by Feigenbaum.

As you know, chaos theory is one of the most important scientific achievements of the twentieth century and turns out to be relevant in several fields of science that include Biology, Ecology, Chemistry, Physics, and Economics. Among the most pertinent results, I think it is worth emphasizing the discoveries of Albert Libchaber and Jens Maurer in 1978 in regards to liquid helium, for the pathway to turbulence in the dynamics of **convection** for such a fluid corresponds to the ideas here explained, when alpha denotes the **heat** added to the helium.

**Page 6.** Now, to fully appreciate what chaos is, it is pertinent to study carefully some subtle details that take place in the **plenitude of chaos**. When the heat is maximum, that is, when alpha is equal to 4, it would appear that all the dynamics would wander by a dusty strange attractor that encompasses all the interval  $[0, 1]$ , as the shown parabola appears to imply via a signal that travels everywhere and without repetition.

But this is not true. Depending on the initial value  $X_0$ , there are also other cases that give rise to **oscillations** forever and for any period,

as illustrated in the shown diagram for an example having period 3. This figure shows the value of  $X_k$  as a function of the generation  $k$  and includes not only the three values eventually repeated, but also the successive pre-images of all pathways, thirteen generations to the past, that end up in the highest of the three points.

**Page 7.** All this is relevant because there are initial values  $X_0$  that **escape** the dreadful consequences of chaos, for such return dynamically and **vitaly** to the **root** of the tree. These are the **pre-images of zero** that find the way despite the most implacable **nonlinearities** and **heat** and that, by arriving to the **middle** point, pass by the **one** to finally rest at the **origin**.

Notice how these observations remind us of the parable of the weeds, for the wheat in the pre-images of zero is finely surrounded by undesired behaviors that unfortunately end up in the fire.<sup>1</sup> Note how the ideas also remind us of the three exalted friends of prophet Daniel dancing in the highest heat and without consequences and the protection of the prophet himself in the lions den,<sup>2</sup> for as the Psalmist assures us and as we may see it geometrically, “though a thousand fall at your side, ten thousand at your right hand, near you it shall not come.”<sup>3</sup>

**Page 8.** The notions thus explained suggest, I think, some **plain common sense** reflections. For instance, they reaffirm that it is best to avoid **chaos** and its truly **infernal** turbulence, for missing **the point**, even if by a rather small amount “epsilon,” as shown, has, with all probability, tragic consequences. For the famous “**butterfly effect**,” that expresses the incredible variability of chaotic dynamics, does not provide us with good options, for such always leave us irremediably trapped in an empty strange attractor in which

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<sup>1</sup>Mt 13:24-30

<sup>2</sup>Dn 3:1-92, Dn 6:2-24

<sup>3</sup>Ps 91:7

we find no rest.<sup>4</sup>

The advice is then. First, come down the chaotic tree as Zacchaeus did, the famous little one, who by amending his errors diminished his intrinsic **heat** to find the **root** to accept God's salvation for him and his family.<sup>5</sup> This is the same symbolic **root** in which Jesus saw the future apostle Nathanael, that is, "under the fig tree."<sup>6</sup> Second, abandon yourself to the chosen threshold,  $X = Y$ ,<sup>7</sup> to **Jesus** himself seen geometrically in the cross  $X$  and him crucified on it  $Y$ , him who is the **door** and the **narrow gate** (and how narrow it is),<sup>8</sup> to arrive to the love of the **Father** in the gentle state  $X_\infty = 0$  of the **Origen**.<sup>9</sup> And third, move away from nonlinearities when alpha is greater than 1, so that by not amplifying without proportion, you may escape the appointed **dust** that represents death.<sup>10</sup>

These ideas represent, I think, beautiful and accurate connexions between the science of chaos and Christian faith, ideas that are perhaps unexpected given their geometric symbols and their universal concepts. But there is yet even more, as I shall try to explain next.

**Page 9.** Could it be that the **scientific fig tree** has a prophetic value? Could it be that via modern science we are being given a merciful clue that illuminates the ancient word?

As we remembered, Jesus cursed an allegoric **fig tree** without fruit that in consequence dried up to the root.<sup>11</sup> The chaotic fig tree shown here happens not to have any visible fruit, it contains leaves of dust that properly remind us of the leaves used by Adam and Eve to cover

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<sup>4</sup>Jb 40:12-13, Mi 7:17, Hos 8:7

<sup>5</sup>Lk 19:1-10, Mt 18:3-4

<sup>6</sup>Jn 1:45-51

<sup>7</sup>Mk 8:34-35, Lk 9:23-26

<sup>8</sup>Jn 10:9-11, Mt 7:13-14

<sup>9</sup>Mt 11:28-30

<sup>10</sup>Rom 5:12

<sup>11</sup>Mt 21:18-22, Mk 11:12-23, Lk 13:6-9

their shame,<sup>12</sup> and it is consistently **cursed** above the root by the inherent disobedience of crossing the threshold  $X = Y$ .<sup>13</sup>

As you may see it for yourselves, this fig tree (and the other chaotic **trees** previously shown and in consonance with the Gospel of Luke) has a tender branch (or branches) and literally contains a great multitude of bursting buds in its periodic bands. As the foliage in the trees symbolizes the way we progressively move away from the root of goodness, it is normal to ask ourselves if these ideas are a preamble of a near summer, as Jesus expressed it on his eschatological discourse.<sup>14</sup>

Could it be that these ideas represent an urgent scientific parable from the God of humans? Contrary to the opinion of some experts, including some gathered here, I humbly believe that such may be the case. For in the bifurcations diagram it may also be appreciated why the ax lies precisely at the root of the trees, as expressed by John the Baptist,<sup>15</sup> and why **Jesus** said to his astonished disciples that they could also curse the fig tree,<sup>16</sup> no doubt in the same spirit that he rebuked the wind,<sup>17</sup> for both cases reflect his triumph against the evil one and his deeds.<sup>18</sup>

**Pages 10-11.** Although by definition the notions herein and other ancient signs do not allow us to set dates,<sup>19</sup> I believe that they invite us to be vigilant. To end, I like to share with you a poem-song. It is called **Feigenbaum's parabel**.

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For more information visit <http://puente.lawr.ucdavis.edu>.

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<sup>12</sup>Gn 3:7

<sup>13</sup>Dt 30:15-20, Ps 37:22

<sup>14</sup>Mt 24:32-35, Mk 13:28-31, Lk 21:29-33

<sup>15</sup>Mt 3:10

<sup>16</sup>Mt 21:21

<sup>17</sup>Mk 4:39-41

<sup>18</sup>Mk 16:17-18

<sup>19</sup>Mt 24:36, Acts 1:6-7