Code World

A Model of Life's Origin & Operation – LO$_2$

Now taking all callers, and answering any and all questions:

What is Code World?

It is many things. It is a toy. It is a game. It is a language. It is the genetic code. It is a working model that nicely explains both the origin and operation of Life.

What does that mean?

Code World is the genetic code, and Life is playing Code World.

What does LO$_2$ mean?

LO$_2$ is a clever way to say "Life's Origin & Operaton." It is clever because we say H$_2$O when we mean water. Water is the solution that dissolves and contains Life - allows Life, really. Code World is the solution that dissolves, contains and allows our thoughts about Life to be consistent with Life.

Then shouldn't it be L$_2$O?

No. That's just silly – then it would be Life's Lorigin & Operation. What's lorigin?

Then it's not really that Clever?

We suppose not.

How can you say that it is a Model that explains Life's Origin & Operation?

Because it is true.

If it weren't true, we wouldn't say it.

It is true to say that **Code World is the genetic code, and Life is playing Code World.**
This may be all you will ever need to know. For some, that is enough. For other's, it is not enough to merely know it is true. Some want to understand how and why it is true, and that takes considerably more explanation. We are happy to provide that explanation, no matter how long it takes.

In what way do you mean it is true?

It is logically true, and it is empirically true. In other words, it has no logical flaws, and it is consistent with all known experimental evidence.

Don't we already have a model for this sort of thing?

Yes, but that model is logically and empirically false.

Why would anyone keep that model?

We don't know. It probably has something to do with the enormous investment in it, and nobody wants to lose their investment.

What is the difference between the two models?

Well - besides the fact that one of them is right and the other one is wrong - they are based on two different things. It is a very simple difference that is obvious to anyone with two eyes to see. In this sense, they are both objective models, both objects are clear, and they each have a different object at their base.

What are the two objects?

The old model's object is a line. Code World's object is Code World - more or less. Perhaps it would be more accurate to say that it is a logical system of shapes and the logical relationships between the parts of those shapes. Code World actually is a working model of these shapes, and Code World is the logical foundation of that system.

Why don't the people with the false model see this?

Because, it is both too simple and too difficult for them to see it. Plus, they are being paid to believe in the truth of their model, we suppose. They are scientists, and that is their job, at bottom.

Do you have permission to say these things?

Yes, absolutely. We asked both Mom and Dad, and they both said it was okay.

Won't I be arrested if I share this with Children?

Yes, but only in three states, and what are the odds that you live in one of those states? But in the end, we are actually doing this for the children, so you can feel pretty good about that.

What about the District of Columbia?

No. If you live or work in the District of Columbia, you are entirely safe. Nothing you ever say or do will ever get you arrested, so this model is DC safe.

What if you are just plain wrong?

So be it. It wouldn't be the first time, and it surely won't be the last. Thankfully, there's no law against being wrong… yet.

Is there a chance that you are wrong?

None whatsoever.

How can you say that?

It's the simplicity of logic itself. We are simply saying that the old model is wrong. The old model has already been proven wrong; therefore, we are right. The old model was so logically inconsistent that it barely ever had a chance of being right.

Maybe you are making a mistake of logic, or maybe you just don't understand models in general and these two models in particular. Ever thought of that?

Absolutely. There always is that chance. But in this case, the failure to understand models was made first with the old model.

How can you say that?

Well, in this case we can begin to talk about the genetic code, because that is precisely where we got the old model. In that case, they failed to make a clear distinction between the model and the thing itself. They then went off and attributed all aspects of the model to the thing, but the thing itself does not fit the model. Now, sadly, the model is more important than anything it might teach us about the thing.

Where does Code World fit into that problem?

Code World is a physical model that represents the logical relationships between physical things. The genetic code is a physical thing that has both a component of logical relationships and a component of physical things. The physical model that is Code World perfectly reflects, illustrates, demonstrates and explains the real thing that is the Genetic Code in both respects. In other words, Code World and the genetic code are two entirely different things, to be sure, and they never should be confused. But in this case, the two are entirely and logically consistent, so anything we might say about one we can equally well say about the other.

Why would that be any better than the old model?

We can now say more things, and those things have the benefit of not being empirically proven false, as they are now.

Maybe the old model is really the same as Code World, just simpler?

No. They are mutually exclusive models. Only one of them can be right.

Didn't you say it needed to be simple, and isn't the old model as simple as we can make it?

Yes. That is all true. Things should be made as simple as possible, but not simpler. In this case, the old model was made too simple, and so it failed. Code World is as simple as we can possibly make it, but it

is far less simple than the old model. In fact, the key information in the old model – the codon table – can now be simply drawn from Code World.

So Code World is just a fancy codon table?

No. It is not a fancy codon table. It is not even a codon table as that term has come to be understood. Fortunately, you can still derive any and all codon tables from it. This is possible only because it contains all the necessary information to generate any and all codon tables. At the same time, it contains the necessary information to do much more. It's simply far less simple than the simpler model. However, the simplicity of Code World is simply put to better use than the simpler model.

Can you explain how Code World uses its simplicity better?

Sure, it's simple. You just need to understand the nature of a model. Imagine how there can be two things, and those things can be different things. At the same time, each of those two things can at the same time both be many different things, and the same thing. That is what a model is. We take one thing that is a simpler version of another thing, and we use it as a base for understanding the less simple thing.

What are the two things in the Code World model that do this?

Well, actually, with Code World there are at least three things, and actually many more, but let's just call them Thing 1, Thing 2, and Thing 3. Thing 1 is a collection of things that are logically related. Thing 2 is Code World. Thing 3 is a collection of things we understand to be the core processes of Life as they exist in the actual molecules doing them. Code World - the game - is a working model of thing 1, and it is also a working model of Thing 3.

Is this also the logical basis of the old model?

Exactly.

Can you explain that better, but still use these simple terms?

No. That is as well as it can be explained in simple terms. A better explanation will require different words. This is precisely where the simplicity of the model must give way to something much less simple. This is the nature of models.

What do you mean different words?

Well, this is a model that is a thing that bridges two other things. It requires an entirely specialized language to describe each of these three things in any meaningful detail.

Why not just do that?

It's not that easy, and it never will be.

Why?

Well, some of these languages are extremely difficult. Some of the languages don't yet exist, and they will take a large amount of patience, discipline and ability to properly create them. They will require a good deal of language skill and collaboration between language creators. The worst problem, however, is that some of these languages already do exist, and they are making the job much more difficult than it ought to be?

How is that possible?

Well, a lot of these languages exist, but they are based entirely on the old model. The old model is wrong, and so too are the languages that are used to describe it. Now, those languages no longer describe anything useful, but they do strenuously protect the old model. In other words, you can now not talk about any model without at least implicitly accepting the old model first. This does a good deal of harm to the way we must think when we do that.

How can you fix that?

Unfortunately, there is no easy fix. We tried; it didn't work so well.

What can you do?

The only thing we can see to do is now start again at the bottom and try somehow to build the languages up to a level on which they can be understood, used, and then eventually lead to more useful languages.

How long will that take?

By our calculations, at the rate we are going, about one hundred years.

That doesn't work well for me. I've got other things planned. Is there anything you can do in the meantime?

Sure, that's exactly what we are doing here. It's all for the children.

What does that mean?

Well, the old model works just like a virus in the mind of a human. It implants itself in the center of the mind and immediately begins building the material to sustain and protect itself. This becomes a diamond-hard shell for the idea in the mind. Unfortunately, the only way to fix it is to prevent it. There simply is no known cure for the dreaded Linear Virus. We simply must now get to the children before the virus attacks their minds. Code World, remarkably, is like a vaccine that will protect them against future exposure to the virus – which they surely will have. By getting these toys into the hands of children, we will protect the next generation against the sad fate of the last.

Are there any harmful side effects to this vaccine?

None that we know of. The FDA is still taking a close look, but we have the 510K safely in hand, which is the premarket approval. Now we are beginning the large scale human studies in the wild, so to speak.

This sounds a wee bit dangerous, don't you think?

No. Don't be silly. The FDA would never allow us to do this if it were the slightest bit dangerous. Children's minds are remarkably resilient. They are already playing Code World with no problem. They will merely be well positioned to assimilate the harder ideas when they become needed.

Can you vaccinate me?

No. Don't be silly. You are far too old. Your brain is pure diamond at this point.

Would you give it a try?

Okay, but don't say we didn't warn you. You will be diving head first into the deep end of the thought pool, and other than your diamond hard brain, you don't have a helmet.

Tres funny. Now, where do we start?

We start with Thing 1 and Thing 2. We see what they are and how they are related to each other.

Okay, what are they?

Thing 2 is a piece of physical reality. Thing 1 is a pure abstraction of physical reality.

Whoa. You were right. That is quite a dive, and I think I just hit my head. Can you make that a little clearer?

Sure. Let's start with Thing 2, Code World the game. Remember, it is one thing, but it is many things at the same time. Let's say the one thing is the primary object. Let's say the primary object is made of three simpler objects and call them Object 1, Object 2, and Object 3. There are many possible objects that could be the primary object in Code World, and in fact there are many Code Worlds. But in all cases, Object 1 is a shape. Object 2 is a shape, and Object 3 is the relationship between Object 1 and Object 2.

Didn't you say we were not going to start with the abstraction?

This isn't the abstraction.

Oh. Can you give me a physical illustration of this non-abstraction?

Glad to. Object 1 is a dodecahedron. Object 2 is a cube. Object 3 is the relationship between a dodecahedron and a cube.

Yes. That does seem pretty simple, but can you explain what that means?

Absolutely. Starting with the points of one dodecahedron there are 240 possible ways to put the points of a cube on it. Code World - the game - physically does this. By doing this, all 240 cubes become physically and logically linked, and we can call this a language of cubes on a dodecahedron. This physical

device - and this real language - are used to play the game of Code World, or at least one of many possible versions of it.

That seems simple enough; is it not?

No, it is not really simple at all once you get to this point. You need to keep in mind the "many possible" things that are Code World. In this case, we have barely described just one of many possible physical Code Worlds, which is Thing 2. In order to really understand it, we need to consider mental Code World, which is Thing 1.

Can you try to do that?

I surely will, but you need to know that things just got much harder and entirely bizarre. You must begin to think in ways that you have probably never thought before. We will be thinking about essentially the same things, but they must take on the very properties of the way we are thinking about them.

Specifically, what does that mean?

We will still have a primary object made up of Object 1, Object 2, and Object 3. The nature of these things becomes bizarre, and the ideas and languages become infinitely more bizarre.

Then why do this?

There is no way to avoid it. There are no logical alternatives at this point. This is the engine that drives the entire model.

Can you give me a simple example?

No problem. For all intents and purposes, Object 1 could be an infinite number of things; same with Object 2. It's hard to imagine what Object 3 might be, at that point. It might be an infinite number of relationships between two infinite numbers of things.

That is just insane. What do you mean there is no way around this?

We have descended into the realm of pure abstraction. It is an abstraction of a physical reality. We now need languages to deal with this. We are simply talking about the language of logic that merely gives us the language of mathematics, which merely gives us the language of physical reality, which is physics.

Okay. I see what you mean now. But haven't you actually found a way around it, did you not?

Hardly. We have only found a way of dealing with the knowledge that we have no way around it. We also are secure in knowing that logically a way must eventually be found, that is if Life is to ever be properly understood. This is logically the water's edge when it comes to human understanding and the core processes of Life.

Okay, I've come this far. Can you now actually take me to the bottom of the thought pool?

I thought you'd never ask. Buckle up! We here at White Golf Labs have done all the required thought experiments, and drawn the following conclusion. Any model of physical reality must include four essential ingredients: space, time, logic and information.

So what?

This is it. This is where all models of Life must come to life. This is the engine room of any model, so to speak. These are the required elements of any model of physical reality, and all useful models must have all four essential ingredients, and they all must work together.

So, the old model must have these ingredients?

Yes, and it surely does. But it is only at this level, in the engine room, that we can see what they are, how they were put there, why, and how they are working within that model today. With the extreme benefit of hindsight, we can see why they have failed.

And why is that?

Not to put too fine a point on it; it was simple, logical carelessness. The logic of the model never held together, so the rest was destined to fail… eventually.

And the logical failure is what?

The linear model is merely based on a simple tautology. A tautology is a logical argument that is true by virtue of its form. In essence, they started with the argument that life is linear by virtue of being linear. Everything else simply flows from this. The entire language and thinking about this model merely now reflects this tautology.

Weren't they smart enough to know not to do this?

Au contraire, they were too clever by half, simply the smartest people in the world, and that's how they knew that they could actually do this. At the time, they needed to do this.

Why would they need to do this?

Because they simply had to control the model in the engine room; otherwise, they could have no model whatsoever.

What does that mean?

It means that they knew that they needed to somehow account for, contain and actually control all four essential elements of any model of physical reality. They had no practical way of doing this, so they simply did it with the logical foundation of the model. By starting with a logical tautology, they all at once tightly controlled space and time, and completely defined information. It was nothing less than a stroke of genius.

How could they ever possibly get away with this?

Partly by slight of hand, but mostly through inspired industry, creativity, and just plain genius. It is a testament to their genius that it ever worked at all, let alone took so long to fail entirely?

What do you mean fail entirely?

Well, the model depends entirely on its logic. If that logic fails, then the entire model fails. Once the elements of space and time fail to be accounted for, contained and tightly controlled, then the definition of information becomes meaningless, and the entire logic folds from its own weight. When that happens, there is nothing left of the model but the tautology on which it is built, and that's exactly what we have left today. Sad, but logically true. You can hardly blame them for trying.

Why not just acknowledge this mistake and fix it?

That's the sad part. As ugly as the reality is; the alternatives are uglier still. We still cannot contain or control space and time, so we still cannot have a working definition for information. This is an intolerable situation, especially since we were pretty darn happy with the situation we already had before this one reared its ugly head. Why should we want it to change?

Okay, I'll bite, why should we?

Well, basically we should want a better model. At the very least we should want one that isn't based on faulty logic. Any model not based on the old model at least starts with a logical advantage. Then it should at least account for space and time. And it should at least attempt to define information - at least define it in a way that is not complete tautology.

That seems pretty simple. Why not just do it?

Because it is extremely hard to do. We don't even have the basic tools to do this. If it weren't so hard, obviously, they would have done it in the first place. Now, it's not a simple matter of rehabilitating the old model, it's a difficult matter of building an entirely new model from scratch. Unfortunately, the old model strenuously resists any and all efforts to do so. Everything we already know and say is precisely based on that failed model; so how can we ever know and say new things?

Okay, I'll bite again, how can we?

Well, obviously, we need to do it down here, in the darkness and fog of the engine room. Unfortunately, we have to do it ankle deep in the carcass of this long dead model that is putting out a horrible stench from its rotting core. We need words and languages that are only found in that carcass, and they carry the stench. Unfortunately, everybody still loves that damn carcass no matter how much it may stink. They are wholly invested in it and identify with it. To say that your model stinks is to say that you stink, and that's all they ever hear. How would you react to that?

Not well, I'm sure. How do they react?

Not well - about as well as you'd expect. We, the good people here at White Golf Labs, are now merely seen as the model mafia, "nice model you got there; be a shame if anything were to happen to it." They simply deal with it through universal indifference punctuated by intense anger. How else can they deal with it?

What can you do?

We aren't sure. We are working on a twelve-step program for recovery, but we are stuck at about the fifth step. However, at some point we need to start thinking about the children. It's all about the children.

Where, exactly, should the children start?

They need to start with the logic. Logic and information are two ends of the same stick. If a stick doesn't have two ends, then there is no stick. That's the way logic and information work. You can't have information without logic, and you can't have logic without information. Likewise, the kind of information you have will determine the kind of logic and vice versa. The old model was based on linear information and linear logic. The kind of model we need cannot be based on linear logic because we know we will be defining non-linear information.

What about the other two essential elements, space and time?

Here again, we know that we will need a model that must account for the smallest parts of space and the largest parts of space. It must also account for the scales of space between these two. Time is the same way. Life is a process that occurs on the smallest scales of time and the largest, and all scales of time in between.

Do you mean to imply that these essential elements are things apart from each other?

We are not implying that; we are explicitly stating it. Time, space, logic and information are things. They are separate things, and they all represent many things within each thing. These are the essential elements of any model of physical reality, and Life is a thing and a process within physical reality. If we want to model it, we must first have a model that can account for all of these things.

And the Code World model can actually do that?

Absolutely. At bottom, that is what the Code World model is. It is a model of physical reality that accounts for space, time, scales of both, and with a logic that is based on just those things. It produces a definition of information that is purely about the logic of space and time through all scales of space and time.

Does it work?

We think it works beautifully. It is hard to imagine any model that could ever work better. If we ever do imagine a better one, you will be the first to know.

Can you tell me how this model works, here at bottom?

Sure. First, we need to remember that we are talking about things, but more importantly we are talking about sets of things. A set is a mathematical term for a collection of related things. The model at this level will be extremely mathematical, because mathematics is the language we must use when we want to describe the relationships between space and time.

I'm not very good at math. Can't we use a different language?

Nope. We aren't very good at math either, but there is no way around it.

Okay. What are the sets we need?

Remember that the model is based on one thing that is three different things. The primary object contains Object 1, Object 2, and Object 3. Object 1 is a shape, Object 2 is a shape, and Object 3 is the relationship between Object 1 and Object 2. So now we need to start thinking in terms of sets of shapes and sets of relationships between them.

What is a shape?

It too is a set. It is a set of parts with sets of relationships between the parts. Take a cube, for instance. It is a set of eight points, a set of six faces, and a set of twelve edges. There are sets of relationships between points, edges, and faces, as well as sets of relationships between points and edges, points and faces and so forth. The relationships between parts are the spatial logic of the shape. So shapes inherently contain spatial logic. When there is a sameness among and between these parts, we call that spatial symmetry.

What are the shapes in this model?

We could pick from an infinite set of shapes, and the model is logically the same. The Code World model is based on the set of five perfect solids – tetrahedron, octahedron, cube, icosahedron, and dodecahedron. The logic is primarily organized around the sets of points in these shapes.

Why this set of shapes?

Because these are the shapes that have the most spatial symmetry. They not only have the most symmetry within their sets of parts, they have the most symmetry between each other's sets of parts.

What is Object 2?

It is the same set – the five perfect solids.

So Object 1 and Object 2 in the Code World model are the same set of shapes?

Yes. And Object 3 is the set of all possible relationships between these sets. Now, notice that there are two distinctly different kinds of logic based on spatial relationships, and they lead to different kinds of information. There is one logic that relates the parts of a shape, and another logic that relates the parts of one shape to the parts of another shape.

This is too abstract for me. Can you give me a specific example?

Sure. Let's take the simplest example of a physical Code World model. That model has a dodecahedron, which consists of twenty equal points physically connected by pathways to each of its three closest neighbors, which are its edges. That is Object 1. Object 2 is a tetrahedron whose points are coincident with the dodecahedron. Object 3 is the set of relationships between the points of a dodecahedron, the edges of a dodecahedron, and the points of a tetrahedron. Let's call this physical Code World model Code World$_T$. Now Code World$_T$ has the two kinds of logic, the relationship between the sets of parts, and the relationship between these sets of sets. Both of these kinds of spatial logic generate information, and both of these kinds of information create languages.

What do you mean generate information?

Well, if this model has no markings, it has virtually no information. The model contains perfect symmetry, but the symmetry must be broken before it generates information.

Can you explain that a little better?

Sure. Imagine that the dodecahedron is all white and the tetrahedron is all black. This model doesn't generate much information. In other words, we can rotate the tetrahedron in any way, and the model will not appear to have changed. This is the information void of pure symmetry. Now imagine that we

paint one of the points of the dodecahedron red. Now we can rotate the tetrahedron in all possible ways, but there are only four ways that look different. The system now has four states, so it is a two bit system of information. Now imagine that we paint a point on the tetrahedron blue. We now have a three bit system because there are now eight possible states. If we uniquely color all the points of each object, we end up with 120 states. If we add the dual tetrahedron physically to the system – which is a cube, and called Code World$_C$ - we have 240 states.

So there is a logical relationship between symmetry, breaking symmetry, and information?

Exactly. Symmetry provides the logic; symmetry breaking provides the information, and it provides the languages of that information too.

What do you mean languages?

When we pick a shape, we are picking a set of parts and the relationship between those parts. When we label the parts, we can use those labels to describe other parts and other relationships. So we can speak dodecahedron with its points, or we can speak dodecahedron with its faces. The same holds true when we use the relationships between sets of parts and between sets of shapes. We can speak dodecahedron to a tetrahedron with its faces, or with its edges. Or we can speak tetrahedron to a dodecahedron with its points. And so on.

So you are saying that even Code World$_T$ has more than one language?

Yes, precisely. Each of the three objects of Code World$_T$ carries its own language. Generally, we can think of it as speaking tetrahedron to a tetrahedron on a dodecahedron, with all three based on the points. However, any of the parts can be used, and there is an extremely large set of possible ways to do any and all of these things.

What is the time component of all this?

So far, the only thing we have discussed is the logical spatial relationships of shapes and between shapes. This is the logic of space changing within space. When we do this, we must create an order to things, because this is the logic on which we are basing these spatial relationships. Once things are ordered, there exists a before and after to the logic. This is known as a sequence. In this model when we change space in space we must do it sequentially, and that creates a timeline. So, for instance, when we want to specify a point on a dodecahedron by listing its three contiguous faces, we do this sequentially. We say Face 1, Face 2, Face 3 equals Point 1. We can do this again, and say Face 4, Face 5, Face 6 equals Point 2. When we do this with Code World$_T$ we create a sentence that translates the

sequential reading of six faces into the sequential change between two tetrahedrons. So it is a simple language that sequentially translates the change of space through time.

How is this mental model used to play a game with the physical model?

If we take the case of Code World$_T$ there are a set of 120 tetrahedrons physically defined by the points of a dodecahedron and physically constrained by the edges of a dodecahedron. These 120 tetrahedrons are now all logically related by sequences of tetrahedrons in time and space, and described by the four points of the tetrahedron. So we can now pick any tetrahedron and sequentially change it in time and space via any length sequence of the points of the tetrahedron. So, we can play a single game by saying, for instance, 117 becomes 32 by 1,2,1,3,4. Except it is much easier to do this with colors and shapes, which would be more like saying Purple, Red-Yellow becomes Green-Red, Blue by Green, Red, Green, Yellow, Blue.

Are there other ways to do this?

Lots and lots of ways to do this. There is not a single way of doing this exact same thing, but sets and sets of ways of doing it. For instance, we can add the dual tetrahedron to Code World$_T$ and make Code World$_C$ and generate the mirror set of 120 tetrahedrons, so we have 240 tetrahedrons, or if you prefer, we have 240 cubes. The exact same logic applies, and it can be played in the exact same way, but we have now increased the amount of information available.

And Life is playing this exact same game?

No doubt about it.

Don't you find that hard to believe?

We do.

Can you prove it?

No problem.

Can you explain it?

No problem.

Would you please explain it?

Sure. Let's return to the engine room of the model and see what we've now got. We have two sets of spatial relationships and a set of relationships between these two sets. This accounts for the logic and information of space in time. These things now scale on all scales of both time and space. They apply equally well to small levels of time and space, and large levels of time and space, and all the scales that connect the levels. All four essential components of the model are perfectly symmetrical within each thing and between all things. This is precisely the kind of model we know that we need if we are to model Life on any and all scales.

Could you please start modeling it?

Sure, but let's first use this new understanding to see just where the old model went wrong. Since we are talking about objects and sets, lets name the objects and sets. The object of the old model is a line, and the sets are codons and amino acids. In the set of relationships there is only one thing – the linear relationship between codons and amino acids. This then serves as the definition of information in the model. The time component is merely the linear sequence of these relationships. The spatial component is merely the linear sequence of each of these sets. The entire model is self-defined and self-contained. Unfortunately, it failed when empiric evidence proved that translation of codons to amino acids involves components of time and space that aren't contained in this model. This means that the definition of molecular information is now false, and so we can no longer talk about it in a meaningful way.

How is the Code World model different from this?

It is different in every conceivable way.

Can you give me a specific example?

Sure, we can start at the exact same place as the old model and deconstruct it. First of all, we need to recognize that the codon table is positioned fairly high up on the time scale. In other words, it is a product of the model that didn't arrive until well after the model began operating, but it still shows quite nicely the operation of the model. Second, we need to recognize that the old model clearly picked the wrong object, and the wrong sets within that object. A better object is the dodecahedron, and a better set is the nucleotides that make up codons. This not only captures the base of the model – the tetrahedron – but it captures much higher components as well, which are sequences of components. A

codon is not the base, it is a sequence of the base. Most important, we can now see that molecular information is not linear, it has rich components of both time and space, and it is entirely founded in the logic of both.

So how does this show that Life is playing this game?

At this point we need to know that Life is playing this game in ways and on scales that are far too complex for us to understand. It is using not just two sets of molecules but many sets of sets of molecules, and by doing this it is producing many sets of sets that are also playing the game on much higher scales of time and space. The genetic code itself has been played for 5 billion years, and it probably took a billion years to get these sets of molecules that we can see in the codon table.

So it is a codon table?

No, absolutely not. We can make a codon table from it, but that would just be one set and one relationship – like the old model. We need to see how this one set and this one relationship is merely a small part of the model, and we need to see how it logically fits into the overall model. We can do this most simply by expanding Object 1, and applying the sets of molecules to the sets of that object. We here at White Golf Labs have called that the G-Ball. The G-Ball is not a dodecahedron, it is an icosidodecahedron. It has 32 faces, the twelve pentagonal faces of a dodecahedron and the twenty triangular (actually hexagonal) faces of an icosahedron. That is why it is called an icosidodecahedron. It is also called a soccer ball.

So the G-Ball is a soccer ball?

Yes and no. It is more accurate to say that the soccer ball is the spatial logic of the G-Ball, and the G-Ball contains sets of molecular relationships within that logic. The first set is nucleotides, and the G-Ball contains twelve different nucleotides of four kinds. The inherent logic of these relationships creates higher sets that build on each other in a harmonic way. It generates codons, but it also generates sets of codons, and sets of codon sets. Ultimately, it generates all possible nucleotide sequences in an entirely harmonic ways. The next set of molecules is amino acids, and again, this generates the same kind of harmonic sets. The third set of molecules is the harmonic relationship between the first two harmonic set of molecular sets.

Does this sound musical to you?

It does to us, but we aren't very musically inclined.

Does this also show the nature of the language?

It does in part, but for that it is still better to apply the G-Ball to the larger Code World object. Now we can see why Life uses a base 4 sequential language to translate between sets, because ultimately it is positioning molecules and molecular events in both time and space. To do this, it is using molecules that share the spatial features of the Code World model. Nucleotides are pentagons and amino acids are tetrahedrons, so Life is using a spatial language in time to position molecular shapes in space through time. We can see the logic of DNA replication as the cube of Code World$_C$ and we can see the logic of protein translation in either Code World$_T$ or Code World$_C$ when we install the G-Ball in those. So it is a full model of molecular information in all its forms and languages. It also serves as the correct model when we scale these molecular sets down to the level of the atom, or up to the level of whole cells and even whole life forms, or to all Life, for that matter. It scales up and down to the level of time for these both backward and forward in time. It's hard to imagine a better model, at this point.

And so that is what the genetic code is?

Yes, in part. We still don't know what the genetic code is or what it does. We have yet to define it, but we can already see what it is doing. The genetic code is doing many things all at once. It is building proteins, to be sure, but it is also finding proteins to build. So in that sense, the genetic code is equal parts operating system and search engine. The harmonic nature of the molecular sets gives the code a good search space for finding and building new things, and it ensures that the things it builds will be equally good at building new things both higher and lower in the scales of time and space. It is a fully integrated system of molecular information, optimized for the function of creating molecular information.

How did you ever figure all this out?

Dumb luck.

This is the most utterly fantastic thing I've ever seen.

Us too.

What next?

We need to get busy and start building the model.

Why, this model seems fully built?

We it is in one sense, but in a more important sense it has yet to be begun.

What does that mean?

Well, we have done two things. We have identified one very big problem, and proposed one very good solution. We can now start thinking about the problem, and we can start building the solution.

What can I do to help?

The first thing you can do is tell everybody you know about this problem and solution. You can ask them nicely to please stop making the problem worse by ignoring this and continuing to teach the problem as if it is the only possible solution. Everybody needs to start teaching the proper solution and stop repeating the problem. It's for the children. After all, it will be the children that ultimately understand the problem and build the solution.

How long do you think that will take?

About one hundred years.

Why?

It is a big ugly problem with a difficult solution. It will take a long time and a lot of work from a lot of different people with a lot of different skills.

What can I do right now?

Publicize, learn, teach and promote this model.

What about an award to publicly bring attention to the new model?

We think that would be an excellent idea.

What kind of an award?

How about a Nobel. That should do the trick, don't you think.

That sounds pretty salty. Do you really think this deserves a Nobel?

Why not. Everybody who contributed to the old model got one. It seems only fitting that those of us who built a better model should get one too. At least it would send the proper message.

Do you want me to nominate you?

That would be ducky.

Okay. I sent an email to the committee. Now what?

Well, we can begin thinking about building the new model.

Where do we start?

I think we need to start in the engine room of the new model.

How do we do that?

I think we will need an entirely new branch of mathematics, for starters.

Okay, why not do it?

We aren't mathematicians.

If you aren't mathematicians, then how do you know you need a new branch of mathematics?

Good question. That seems like the only way to get started. There don't appear to be any adequate branches of mathematics available, we need a branch, so I guess we'll need to invent one.

Why do you need mathematics?

Well, first of all, the molecules of Life are essentially doing math with molecules. Second, it would be nice to have the right kind of graph paper to keep track of some of this stuff on paper.

What does that mean?

Well, think of this as a simple game where molecules do math with molecules. The game can only be played if there is some system for scoring and some system for keeping score. This is generally the domain of math, but we don't yet have such a system. Think of a thing that can be called molecular information. The game is played, won and lost, by molecules that generate and accumulate molecular information. So the first thing we need is a system that can define, create, quantify, and keep track of molecular information – on a molecular level.

What does that mean?

Well, this is the point where the language and words from the old model have broken down and now are merely getting in the way. We need to build new languages and words that can actually get the job done, and those will originate in mathematics and branch out from there.

Like what kinds of words?

The basic words here are words like information, genetic, molecular, logic, language and code. These will all need to be defined and combined in formal ways that can identify, quantify, translate and generate these things, and many things in addition to them.

That seems like a pretty big problem. Can it actually be done?

It is and it can.

How?

Well, we here at White Golf Labs are not mathematicians, but that has not stopped us from thinking hard about the problem, and we have some opinions about it.

Such as?

We have colorfully described those opinions elsewhere, but we can touch on the main points a bit here, perhaps. First of all, we are talking about things that essentially create themselves, so the image of a snake eating its tail comes to mind. In this case, we have sets of things that are literally sets of the same things, so that is helpful. Ultimately, the whole language will be based on a new form of a counting language?

What does that mean?

Well, all branches of mathematics are based on forms of counting. This usually starts with a thing, and then this thing forms a set of those things. We then uniquely identify each thing in the set, and establish a logical relationship between all things in the set. This is what counting is. We generally think in terms of a base 2 counting language, in other words each thing is logically related to the thing before it and the thing after it, so we end up with a linear sequence of things. The thing that is "counted" is merely a member of that set of things as well.

Is that how Code World counting will work?

Yes and no. There are key similarities, but there are also key differences. The first key difference is that it will be base 4 counting. The second key difference is that the things being counted are actually sets of things, and the thing "counted" is also a set of things. So it will be a base 4 counting language that counts sets with sets instead of a base 2 counting language that counts things with things. That's basically why it appears that a new branch of mathematics is required.

Are there any real consequences of doing it this way?

Yes, the consequences are real, extreme and bizarre.

Like what?

For starters, it utterly destroys our common notions of counting. After that it bizarrely twists our common notions of mathematics and how it is practiced. The language of mathematics changes in fundamental ways, but fortunately it changes to be more like the languages of life.

Why do you say that?

Well, let's take as a simple example a gene and a protein. We need to recognize that the meanings of these two words got utterly destroyed by the failure of the old model. We can no longer even define a

gene or a protein, and we never properly could. Let's just suppose we had a language that could define these two things. It would mean that a gene contained something that we wanted to call molecular information. There would be a language or a process by which this thing is translated from the gene to the protein. Now we would have two different versions of the same thing – the molecular information of the gene would exist in both the gene and the protein. We still don't know what any of these things actually is, but we can know what they represent and we can begin talking about them in a meaningful way. We can know that this thing – molecular information – is contained in all of these things, the gene, the protein and the code that translates between the two. It's all fundamentally the same thing.

What is that?

All of this molecular information must exist someplace in space and time and it must have come from someplace in space and time. We could now use this mathematical language to identify this thing, track it and keep score. From this perspective we could see that the bulk of the molecular information actually exists in the code, and it took long periods of time to get there. It is also translated in short periods of time from the gene to the protein, and it will eventually translate in still other forms back from the protein to the gene. We can't know what these are, yet, but we can know their nature and that they actually are there. In other words, the gene and the protein represent the same thing – molecular information – in equal quantities, but in different forms in time and space. The code itself represents "genetic information" in every conceivable sense of these words.

That sounds like a difficult language, does it not?

We think it is, but why would we ever expect anything less. If such a language were to exist, we could then make some kind of a graph to identify it, track it, and otherwise keep score. We could do math with these base 4 numbers. Think about the gene as a single base 4 number. The protein is merely a different version of this number. Somewhere, somehow there can be a graph between the two. There also is a graph between all possible genes, all possible proteins, and between all possible genes and proteins. That would be a helluva graph, but it also would scale in time and space. What we are talking about is a base 4 counting language that leads to a new kind of math. That math would come with a bizarre form of molecular information graph paper, which would also represent a still more bizarre form of genetic information graph paper.

Where can I get some of that paper?

It seems to us that it is virtually impossible to put this on paper. This kind of graph paper can surely only exist on a computer, and even that is conceptually difficult. Any or all of it would only be possible if such a form of mathematics were to exist, and we here at White Golf Labs have none of the ability required

to do such a difficult thing, but that doesn't mean it can't be done… somehow. When it is, it not only will borrow from the Code World model; it will be a tremendous foundation toward building it.

Okay, I see what you mean about the math. Let's assume that is done. What else could we do now?

The first thing that needs to be done is that we need to get a handle on the actual scope of the problem. We need to understand this problem in terms of scope with regard to both time and space, and that actually is pretty easy to do. We can define space as Earth, and we can define time as the period between the beginning of Earth until now. That is time zero to time now.

Do we actually have ideas about these things?

Yes, lots of them. Generally speaking, the ideas consist of what we might call Geochemistry and Biochemistry. In space, Geochemistry concerns itself both at the level of the atom, and the level of Earth. In time, Geochemistry concerns itself with both very short periods and very long periods. In space, Biochemistry concerns itself at the level of molecules and how they combine to form cells and bodies. In time, Biochemistry concerns itself at the level of molecular interactions and at the level of cellular interactions.

These seem like highly compatible fields of ideas. Are they not?

No. They both see themselves as formally incompatible. They explicitly state that they are not compatible and therefore will not interact with each other and therefore will not share ideas.

Why not?

Well, it is either willful ignorance or cussed stubbornness, we suppose.

Isn't Biochemistry merely a sub-field of Geochemistry?

That's the way we see it; but they don't see it that way.

What do you propose to do about this?

Plow ahead, of course.

How?

Well, we will bring the ideas of each to the other. Eventually they will both get it, we suppose.

Can you somehow force them to interact and exchange ideas?

Probably not. We have tried to shame them into doing it, but these people don't shame easy. The conceptual gap is too wide and too solid.

Wouldn't Code World actually bridge this gap?

Absolutely. No doubt about it. But the Linear Virus has formed a diamond-hard shell around the mind's in both of these fields.

What do you plan to do?

Well, each field is organized around first principles. These consist of organizing principles and animating principles. We will need both from both. The organizing principles of Geochemistry are strong, but the animating principles are weak. The animating principles of Biochemistry are strong, but the organizing principles are weak. We plan to bring the animating principles to Geochemistry and the organizing principles to Biochemistry.

How?

The tougher nut to crack, we assume, is getting the animating principles of Biochemistry down into Geochemistry. So we guess we'll start there.

What are these animating principles?

The single most powerful principle in Biochemistry is Natural Selection. It organizes the information, but it more powerfully animates it in both time and space.

What if I don't like the idea of Natural Selection?

Get over it.

How do you get that down into Geochemistry?

Not terribly easily, we suppose, but it can logically be done. The first thing to do is understand Natural Selection in terms compatible with Geochemistry, we suppose.

How?

Start by recognizing that Natural Selection is a form of logic. As a logic, Natural Selection generates information. So we need to understand the nature of both the logic and the information that it generates. The logic of Natural Selection is simple. We start with a set of things, and we select from the set. This generates information. This set then generates a new set upon which new selections will be made, and therefore new information will be generated. This is what we call an iterative process. An iterative process is one that operates on an input to generate an output. The process then uses the output as its new input, and the same process merely repeats endlessly.

Okay. What next?

Next we need to note that the process is competitive. This means that the members of the set being processed will compete to be members of future sets.

Sounds pretty emotional. Is it?

No. We need to leave emotions out of this entirely. In fact, no motivation or volition need be inferred. It is a purely logical process.

Okay. What next?

Next we need to recognize that information is being both created and stored in the sets upon which the process is operating. The information is also being organized by the process. Whenever a process creates, organizes and stores information, we can call this learning.

So what?

Well, we can now simply describe Natural Selection as a logical process of iterative, competitive learning.

So what?

Well, this is the animating principle of Biochemistry that must now somehow be brought to the level of ideas in Geochemistry. We need to see how this new animating principle of Geochemistry can operate at the level of the atom to generate the level of the molecule needed by Biochemistry.

Is that possible?

Sure. At this point, it's easy.

How?

We start by understanding the organizing principles of Geochemistry. These start at the level of the atom. When atoms interact and form stable relationships we might call this a molecule, but in Geochemistry we have a special word for molecules. We call them crystals. So we will start by taking this word and using it in all scales of the system. Geochemistry is organized around atoms and the systems in which they form stable arrangements. We call these crystal systems. There are many known crystal systems and they are of many kinds.

So you intend to use the word crystal within Biochemistry systems?

Absolutely. At all scales of time and space, and for all scales between the two. We will define Life as a single crystal system that is built upon multiple crystals in multiple crystal subsystems. Molecular information is in some real sense crystal information within the system in general. Genetic information is the logic and information of crystals creating crystals. The math that molecules do is a form of crystal math in both time and space.

Is this an appropriate use of the word 'crystal?'

We think so.

Is there any such known system in Geochemistry?

No.

Do you have a problem with that?

No.

How do you propose to actually fit the animating principle of Natural Selection into your crystal system?

We start with the organizing principles of any crystal system. And then we recognize that the idea of Natural Selection as a process, and the idea of a crystal system are both perfectly symmetrical ideas within all contexts of both time and space. In other words, there is no point where Natural Selection starts or stops operating. Likewise, there is no point when the molecules of this system start or stop being crystals within the system. Natural Selection is operating from top to bottom, from start to finish. They are growing crystals within a growing crystal system from top to bottom, from start to finish.

And these symmetrical organizing principles of a crystal system are what?

The two things we need are atoms and a crystal system in which to put them.

How?

Think of a game of tic-tac-toe. What is it? It is a game system that consists of a board, some pieces, and some simple rules. As each piece is placed, the next piece gets placed according to some logic of the game. The board contains a simple logic, the pieces contain a simple logic, and the game is played by the simple logic of the pieces interacting on the board. This is exactly how crystals form.

How?

Think of ordinary salt as playing a three-dimensional game of tic-tac-toe. The pieces are merely sodium and chloride atoms, and the board is a simple cube. The pieces contain their own logic and the logic of the board, so they can automatically play the game without supervision. In this sense, each piece competes for its place in the game and its logical position in the game. The game is entirely iterative in both time and space. The results of the game are recorded in the play of the game itself. Molecular information is both created and stored in the playing of any game.

And this is driven by Natural Selection?

No, this is the fuel that Natural Selection can burn in an iterative process of the game. With salt, the game merely gets played once, locked in and recorded. With Life, the game must be repeatedly played.

How?

Salt is not an inherently iterative game of this nature. If atoms can find a similar game that is inherently iterative, then Natural Selection can drive it.

How?

Try to imagine what would happen if future games of tic-tac-toe could be played with past games. What would happen? First, the boards of past games would become the pieces of future games. Second, the boards of future games would need to change to accommodate the future pieces. This is what we call evolution, which is the result of Natural Selection. In other words, this layering of tic-tac-toe would force the evolution of both the pieces and the board. The new pieces would need to carry their own rules, and the new board would need to accommodate the new pieces. The rules of the game would need to evolve with the board and pieces.

And you think this is happening with the crystals of life.

This is exactly what is happening.

For this to happen, wouldn't you need an inherently iterative crystal board with inherently iterative crystals.

Yes.

Do you have one?

Yes.

Are you going to tell me what it is?

It is water.

Water is the crystal game board of Life?

Absolutely.

How?

Water is a molecule but it is not a crystal. As a molecule it forms tetrahedrons with other water molecules. This is the logical foundation of a base 4 system. This is the base from which all higher systems have grown, and from which they derive their inherent logic, information, and languages.

This base represents a crystal?

This base does not represent a crystal but a dynamic crystal game board in which pieces can play and from which higher pieces and boards and games can grow. One of these games can be seen in "the genetic code" as forming protein crystals from the molecular information contained in DNA crystals. But we can be sure that the same "code" is responsible for the pieces, boards, and all of the games above and below it. This is the nature of the game, the nature of the information, the nature of the languages and rules, and the very nature of recording all of these things in the games themselves. This is the essence of evolution. It is an evolution of not just information, but an evolution of information systems.

So the genetic code is not one thing but many things within this system?

Yes. You might say that it is one thing at the level of the engine room. But that one thing has driven the evolution of the many things that are playing different versions of the same game. These things are playing the same game at any and all levels, at the level of the atom and at the level of all crystals in the total crystal system that is Life. Now we can clearly see how we need to see how one thing can be many things at the same time. Each of these things borrow from the others, but each of them has their own pieces, boards, and rules between them.

So the pieces evolve, the boards evolve, and the codes evolve with them?

Exactly.

That's utterly fantastic, don't you think?

We do.

So how do we now keep score in this ever evolving game of crystal formation?

We don't. That's the basic problem. We know what the game is and basically how it is played, but the score is kept in units of molecular information. Each of these units would need to somehow be graphed on a graph paper that is evolving with the game itself. This same information is contained within the rules of each game, in their genetic codes, or their codes of forming yet higher pieces and higher boards.

How could you ever keep such a score?

Well, this thing, this information, whatever it is, can be thought of as points in the system. It is like a currency that is held by the pieces, the boards and the codes. They spend it and save it just like money. The winners are the ones with the most money. Those are the ones that get to keep playing the game, according to the logic of Natural Selection.

How?

It's like an economy of information, but it is both molecular and genetic. It is a system of molecules, but it is also a system of generating molecules. The currency of this system is some form of information in both time and space. As the system grows in time it grows in space, and vice versa. This is why protein synthesis turns on the ability to store it, translate it, and create it. This is why the code of protein synthesis must be a code that stores, builds and generates new information. It is not merely a system of translation. It is a part of the game being played. This is precisely what the game is, and this is how the game is played at every conceivable level of the game.

How could the old model ever capture and contain this system?

It couldn't. That's why it failed in miserably comical ways.

How can the new model ever capture and contain it?

We don't know. It seems to capture it, but containing it is another matter entirely. We estimate that it will take about one hundred years.

I see what you mean. Is there anything we can do in the meantime?

Yes. We can enjoy it. We can play with it. For instance, we can look at a tree and say, "look at that beautiful crystal. I wonder what it means." Or we can look at a butterfly and say, "look at that beautiful

crystal. I'll bet it took a billion years to form in just that way. I sure am glad that it did, so I could enjoy it, watch it move around, and wonder about how it formed from the genetic information contained in a single cell." Or here is one of our favorites. Tell your cat this: "You were once a single cell that could be called a single crystal. Now look at you, trillions of crystals, all perfectly synchronized within a single system of building more crystals. Want some food?"

Anything else?

Sure. We can play with Code World and marvel how it scales so well in time and space within this system of information. We can imagine we are carbon in water, or we can imagine we are nucleotides and amino acids, or we can imagine that we are any one of the millions of fabulous crystal machines that are built from other crystal machines within the system.

So the genetic code seems pretty important in all this, does it not?

It would appear that way.

Can you tell me in these terms what it actually is?

Nope.

Can you try?

Sure. We first need to recognize that it is now many things all at once. One of these things is surely the logical set of relationships between spatial symmetries through time. Another thing is surely Code World the toy. Another thing is surely the set of molecules that executes protein synthesis, and DNA replication, and all the sets of molecules in between, above and below. We know that whatever this thing is, it is positioned between Geochemistry and Biochemistry, and it conceptually ties the two together. It is the thing that drives Geochemistry into Biochemistry and makes it sit up and take note.

This is utterly fantastic. What are we going to do?

We are doing it.

Aren't you going to tell anybody about this?

We have told everybody we can think of in every conceivable way we can think of.

What did they say?

Not interested.

Why not?

Don't need it. No use for it. Can't follow it.

Seriously? Can't you make them listen?

Nope. Their minds are now made of pure diamond. We took a ballpeen hammer to them, and all we got were sore wrists trying to crack through.

What about journals?

Won't print it. Not science as they know it.

What about the local papers?

Won't print it. Not news, and they are too busy covering the local church bake sale.

Maybe you haven't made it explosive enough. Maybe you didn't make it seem important. Have you thought about making the idea bigger, more powerful?

That's just it. The idea is too big, too important and too powerful. If a mind ever gets it, the mind explodes with ideas. These kinds of explosions are too big and too frightening, so people are naturally repelled by them.

What now?

Well, perhaps it's better to say it's just a toy and nothing more. After all, it's a pretty cool toy. At least that way we won't worry about harming the children.

Isn't there anything we can do?

Sure. We can save the children. We can start vaccinating them against the malignant Linear Virus before it has a chance to turn their minds to diamond.

How?

Give them a Code World and tell them to play with it and think about it. Tell them to not take any wooden nickels. It's not much, but it's a start.

Will that work?

It's gonna have to. It worked for us. Look at how much we learned just by playing with this simple toy and the simple idea it contains. Code World is the genetic code, and Life is playing Code World.