Foundations of Quantum Field Theory and It’s Particulates

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Abstract

We propose a solution to the Mass Gap and Yang Mills problem establish by the Clay Mathematics Institute.

May 17th, 2013

Keywords: Mass-Gap, Yang-Mills equation, Non-Abelian Gauge Theory, Supersymmetry, Supergravity, AdS-CFT Conjecture, Supergeometry, Finite Geometry, String Topology, Physicalist Program, Quantum Field Theory, Quantum Cosmology, Quantum Gravity, Astrophysics, Physical Cosmology, Second Quantization, Third Quantization, Quantum Mechanics, Information Theory, Khovanov Homology, D-branes, Conformal Field Theory, Constructive Field Theory, Statistical Quantization, Current Algebra, Quark Confinement, Super Yang-Mills, Wilson Operator, Holographic Counterterm, Ergodic Theory
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Introduction: Historical Overview

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The goal of this article is to isolate a coherent and formal understanding of the relevant quantum field theory [QFT] operations. QFT arose, in the Mid-1960’s, as a special relativistic solution to particle interactions [1]. It was understood, earlier by Paul Dirac and his contemporaries, that quantum mechanics is a limited paradigm. With the continuing advances that came about in atomic physics QFT evolved in such a rapid rate that quantum electrodynamics, quantum chromodynamics, Electro-Weak theory, and the Standard Model gave physicists an accurate and deep understanding of the basic structure of force particles.

Yang-Mills theory emerged as the primary element that extracted the bosonic interactions. Even then there was still the problem as to how to include fermionic particles: resulting in the discovery of supersymmetry [SUSY] as the unifying concept that eventually led to the First and Second String Theory Revolution giving physicists a clearer knowledge of the underlying properties of both matter and force particles as one-dimensional strings interacting with one another, through the mechanism of D-branes, as 11-dimensional supergravity [SUGRA] [2, 3]. Where we define SUSY as the symmetry of a $Z_2$-graded geometry and SUGRA as a spin-2 field whose quantum is the graviton.

Novel mathematics emerged, through this process, that gave a stunning and beautiful tapestry of the interface between physical cosmology and high energy physics. It wasn’t clearly understood where such mathematics would take physicists in the entire program of grand unification. After considerable advances in mathematics, and with experiments undergone at the Large Hadron Collider at CERN, in Switzerland, it was known that theoretical high energy physics became more and more compatible with the experimental findings produced at CERN which found the Higg’s Boson to be situated at the energy range of 125.3 GeV as predicted by string theorists.

QFT, in its particularity, attempts to quantize fields with an infinite number of degrees of freedom by bringing gauge theory and quantum mechanics together [1]. In doing so QFT would be defined by the mathematics of path integrals and commutation relations [3].

As such Chen-Ning Yang and Robert Mills extended abelian gauge theory of quantum electrodynamics to non-abelian gauge theory to provide an explanation of the strong interactions. Eventually non-abelian gauge theory would prove instrumental in the development of the Standard Model and the fruition of new physics in the form of superstrings and the universal law of nature. The Higgs mechanism, as implied earlier, provided the final synthesis for both the completion of the Standard Model and the resolution of the hierarchy problem.

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1.2

Gauge theory was largely ignored when it was introduced by C.N. Yang and Robert Mills [4]. The theory was revivified when it was realized that particles acquire mass through symmetry breaking in massless physical theories. Resulting in a sudden explosion of interest in gauge theory that led to development of quantum chromodynamics [QCD] and electroweak theory.

We define Yang-Mills equation as the following Lagrangian [4]:

\[ [1.2.1] \quad L(V) = \frac{1}{2} \int_M \| R \nabla \| \, \mathbf{2} \rho \]

Where $R$ is the curvature defined for a connection $\nabla$ 2-form as [5]:

\[ [1.2.2] \quad \| R \nabla \| = \langle R \nabla, R \nabla \rangle \quad \text{Hom}, \, 2 \]

A more intuitive approach defines the Langragian of Yang-Mills as [1]:

\[ [1.2.3] \quad S = \int d^4x \left( -\frac{1}{2} \text{Tr} F_{\mu\nu} F^{\mu\nu} \right) \]

One can say that gauge theory is a particular theory in which the Lagrangian remains unchanged under a continous group of local transformations. This is important because it allows us to relate different theories to each other. For example the
electroweak theory is described by $\text{SU}(2) \times \text{U}(1)$ while QCD is described by $\text{SU}(3)$ Yang Mills theory. This allows us to formulate the Standard Model as:

$$[1.2.4] \quad \text{SU}(2) \times \text{U}(1) \times \text{SU}(3)$$

Finally we note that Electroweak and Yang-Mills is a non-abelian gauge theory while electrodynamics is an abelian gauge theory [1].

Yang-Mills and the mass gap is base on an important theoretical conjecture:

*The Lowest Excitations of a pure Yang-Mills theory [without matter fields] have a finite mass gap with regard to the vacuum state.*

In a sense the goal is to produce an example of Yang-Mills in 4-dimensional space-time. To do so renders the development of a mathematical definition of QFT as a branch of the mathematical sciences [6].

The paradox involved is that pure Yang-Mills theory doesn’t allow for matter particles yet matter is an attribute of observed phenomenon. To resolve this contradiction it is important to create a particular four dimensional Yang-Mills in which there is a mass gap as well. The mass gap would go along way in resolving the problem why the nuclear force is strong but short range [6]. Through this process we also need to explain why we only see individual quarks and account for current algebra.

Over the last few years considerable advances in the physical sciences yielded a burst of novel formal properties that has led to new areas of mathematics. In particular much of what has been extracted in the past, in the field of physical sciences, has always led to newer branches of theoretical mathematics. As Sir. Isaac Newton invented the field of classical mechanics, along with Gottfried Liebniz, eventually the branch of analysis came about through the efforts of 19th century mathematicians.

In particular the question is raised whether or not pure mathematics, in itself, has any correspondence to the natural world? It was shown by Kurt Gödel, in the early 20th century, that pure mathematics has no direct correspondence [7]. Rather the project of mathematics is in the realm of applications to the physical sciences.

In the same way, from a perspectivist account, different models can adequately serve as relevant explanations to similar physical phenomena. It would be optimal to pursue a new [physicalist] program in which the physical sciences proceeds by simplification of the architecture and by cataloguing those models as interrelated physical statements base on the same problems they pose.

Holography, or AdS/CFT [Anti-de Sitter Space/Conformal Field Theory] correspondence, is also important in this manner: it simplifies the physical sciences in a powerful way while stating that much of what is understood about the physical world is nothing more but a higher dimensional holographic projection [2]. That strings is related to certain conformally invariant quantum field theories [ N = 4 super-Yang Mills with gauge group SU (N)].

Even then the introduction of Khovanov homology by Edward Witten [IAS] led to a profound methodology of studying the interaction of strings by introducing the Wilson operator and Jones Polynomial as operations of both different and multiple quantum states [8]. Applying such methodology led to a consistent unification procedure.

As such we have skimmed very quickly in order to articulate what the task will be in the next section. We hope to suggest that we have expressed a four-dimensional example of non-abelian gauge theory showing the interrelationship
between different areas of mathematics in the scheme of both topological quantum cosmology and constructive field theory. To include AdS/CFT correspondence we will also demonstrate that we need no longer take into account geometric properties rather to view the algorithm as finite algebra.
To understand the foundation of QFT is to extract the mathematical properties that underlie the protocol of second quantization.

Here we define the mathematical elements of the relevant QFT operations:

1. \( H \rightarrow \mathbb{C} \rightarrow \mathbb{Z} \rightarrow \mathbb{R} \) s.t. \( \mathbb{R}^n \equiv \mathbb{R}^1 \times \ldots \times \mathbb{R}^n \)

2. \( \{x_n \in \mathbb{H}^n \mid x_1 \cap \ldots \cap x_n\} \)

3. \( \exists t \text{ s.t. } t \rightarrow \text{it} \)

4. \( \partial : \nabla_t \rightarrow \nabla_{t'} \)

5. \( \Psi \in \mathbb{C} \)

6. \( |\Psi|^2 |\in \mathbb{R} \)

7. Given \( \Psi( f_1), \Psi( f_2), \ldots, \Psi( f_n) \)
   \( \forall f \text{ s.t. } f_n \in \mathbb{R}^n \)
   \( \Rightarrow <\Omega, \Omega(\Psi(f_1)) \ldots \Omega(\Psi(f_n))> \)

8. \( H \otimes \Psi = \overline{\Psi}(t) \)
   \( V : \mathcal{F} \rightarrow \text{Aut}(H) \)
   \( V : \mathcal{F} \rightarrow \Psi(t) \)
   \( \Rightarrow V : \text{Aut}(H) \rightarrow \Psi(t) \)
   \( \overline{\Psi}(t) = H \otimes \bigoplus_{j=1}^n \Psi_1 \otimes (\Psi \otimes \Psi_2) \otimes \ldots \otimes (\Psi \otimes \ldots \otimes \Psi_j) \)

   \( \Rightarrow \) statistical quantization from which \( \mathbb{R}^n \rightarrow \mathbb{R}^\otimes. \)

9. \( \exists x_i \text{ s.t. } \{x_i \in \mathbb{H}^i \mid x_1 \cap \ldots \cap x_i\} \text{ where } \Psi \in \mathbb{C}, \text{ s.t. } \exists \overline{\Psi}(t) \)

   \( \Rightarrow Z(J) = <\Psi_n | e^{-iHT} | \Psi_{n+1}> = D \overline{\Psi}(t) e^{\int_0^T \mathcal{H}_L(\Psi_n, \Psi_{n+1})} \)

   Physical definition of QFT.

   Each of these elements are constructed from object 1 to object 9. That is to say that QFT is defined as the analysis of object 9.

The articulation of all the mathematical properties is not a redundant artifact that is only slightly implied. We may state that stringy, as it is, is the bedrock of QFT, is the process toward third quantization: the particularity of second quantization.

In fact we state the following theorem:

**Witten’s Domain:**

\[ \forall \Psi \rightarrow H \equiv H \]

**Proof:**
∀ ψ_j, where j = 1, ..., n, ψ_j is the cosmological wave function. Let ψ_j ∈ H^n where \ ε is an imaginary element.

If:

\[
\begin{align*}
H^n &\rightarrow H^n \\
\uparrow &\quad \downarrow \\
H^n &\leftarrow H^n
\end{align*}
\]

where:

\[
\begin{align*}
\Psi \\
\Downarrow \\
\Psi \iff H^n \iff \Psi
\end{align*}
\]

s.t. \ H^{n_1} \rightarrow \Psi^{n_1} \\
\ H^{n_1} \rightarrow \Psi^{n_n}

⇒ consistency

⇒ Aut (H^n) → \Psi^{n_1} \\
\ Aut (H^n) → \Psi^{n_n}

⇒ H^n \equiv H^n

□
There is a rather astonishing factor of ergodic theory: the physical operations remain stable under a long-term process [9]. So in doing so there is consistency.

We see two underlying implications:
1. Self-regulating quantum cosmology.
2. Self-replicating quantum cosmology.

There are no adjustment to the physical state.

We make a subtle distinction is terms of Witten’s domain: we no longer depend on pure geometry rather on the abstract properties of space-time. We must treat space-time as an information system. To do so is to see QFT as an property of an underlying algorithm. Physical cosmology is a consequence of a holographic property.

The algorithm are parametric controls, in a sense, that varying algorithm imply varying topological cosmologies.

The source code is the universal law of nature:

\[
\text{Source Code} \rightarrow \text{Algorithm} \rightarrow \text{The topology of knots} \\
\uparrow \quad \text{[Topological Quantum Cosmology]} \quad \downarrow \\
\text{The Structure of Space-Time} \leftarrow \text{General Relativity} \leftarrow \text{Quantum Mechanics}
\]

We now see that the axioms are articulates of mathematical theory:

\[
\text{K-theory} \rightarrow \text{Set Theory} \rightarrow \text{Differential Geometry} \rightarrow \text{Global Hyperbolicity and Dynamical Systems} \\
\uparrow \quad \text{Schemes} \quad \downarrow \text{Analysis} \\
\text{Superspace in } \mathbb{R}^n \leftarrow \text{Definition of QFT} \leftarrow \text{Represenation Theory and Algebraic Geometry} \leftarrow \text{Symplectic Geometry}
\]

We now provide a definition of QFT:

**Definition of QFT:**

- The set of all \( |\varphi| \in \mathbb{R} \) that extends to \( \mathcal{H}^n \) endowed with a super-Hilbert representational algebra.

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### 2.2

Keeping in mind what we've stated before that stringy is a universal law of nature: Khovanov homological model. We aim to relate these findings with two goals at hand [6]:

1. Determine the mass gap s.t. \( \Delta > 0 \).
2. Demonstrate that Yang-Mills in \( \mathbb{R}^4 \) exists.

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### 2.3

We will demonstrate an equivalence between two results: equation 1.2.3 and an earlier result .

\[
(2.3.1) \int d^4x ( - \frac{1}{2} \text{Tr} F_{\mu\nu} F^{\mu\nu} ) = \int \text{Tr} \ F \wedge F
\]
\[(2.3.2) \quad \text{Tr } F \wedge F = d^4x \left( - \frac{1}{2} \text{Tr } F_{\mu\nu} F^{\mu\nu} \right)\]

\[(2.3.3) \quad F \wedge F = d^4x \left( - \frac{1}{2} F_{\mu\nu} F^{\mu\nu} \right)\]

\[(2.3.4) \quad F \wedge F = - \frac{1}{2} F_{\mu\nu} d^2x \wedge F^{\mu\nu} d^2x\]

\[(2.3.5) \quad F = - \frac{1}{2} F_{\mu\nu} d^2x \quad \text{and} \quad F = F^{\mu\nu} d^2x\]

Such that we have:

\[(2.3.6) \quad F = - \frac{1}{2} F_{\mu\nu} \implies \text{Boson}\]

\[(2.3.7) \quad F = F^{\mu\nu} \implies \text{Fermion}\]

We have produced a particular Yang-Mills, which includes a fermionic property, by relating it with equation [1.2.3]. The earlier result happens to be Yang-Mills in \(\mathbb{R}^4\) produced in *The Logical Structure of Space-Time*.

Before we move forward we must calculate the mass gap.

\[\Delta \text{ is the energy between the vacuum and the next lowest energy, in otherwords, the mass of the lightest particle [5]. We proceed by calculation using } 1/N \text{ expansion and duality transformation of a rudimentary component of the Wilson operator to make the mass gap more classically visible:}\]

\[(2.4.1) \quad W(\ell, l) = \text{Tr}_R P \exp \left( - \oint \frac{\pi}{k^2} e^{i(\omega - k \cdot \vec{x})} \sqrt{-h} \frac{1}{\ell} \right)\]

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\[(2.4.2) \quad k = \frac{1}{4 \pi a'}\]

\[(2.4.3) \quad \tilde{L}_{\text{min}} \sim 2 \sqrt{\alpha'}\]

Enabling the expression:

\[(2.4.4) \quad \tilde{L}_{\text{min}} \sim L_p\]

\[(2.4.4) \quad L_p = \sqrt{\hbar G_n / c^3}\]

Allow \(c^3 / G_n\) by \(1/N\) expansion.

Allowing the following duality transformation
\begin{align}
(2.4.5) \quad \frac{EA}{c} &= \hbar \\
(2.4.6) \quad E &= \frac{hc}{\lambda} \\
(2.4.7) \quad E^2 &= \left( \frac{hc}{\lambda} \right)^2 = (2m_{\text{up}})^2 \\
(2.4.8) \quad \Rightarrow \Delta &= m_{\text{up}} = \frac{E}{2}
\end{align}

2.5

Recap: In the matter of quark confinement we have to explain why we only see individual quarks? In such a process the more energetic the mass the more confinement breaks down. The process becomes fluid like that the quarks scatter unable to bond to each other. The more anyone tries to see the quarks confined the more energy is needed to do so yet confinement is broken.

The question is now raised as to why the nuclear force is strong but short range? It is because mass is lost, converted into antimatter, as the distance becomes larger breaking free from the Higgs Mechanism. Yet again the Higgs Mechanism explains, for Section 2.3, why there is mass yet standard non-abelian gauge theory doesn't allow it.

Tentatively Yang-Mills in $\mathbb{R}^4$ is established quantitatively but at the moment it does not meet the standard rigor of constructive field theory.

Note: Given object 9 we’ve related QFT with supergeometry with Super-Yang Mills gauge analog by application of equation 2.3.1 and 2.4.1. Concurrently we relate string topology [third quantization] by stating the AdS/CFT Conjecture [2].

**AdS/CFT Conjecture**: String Theory on certain SUGRA geometries; that include anti-de Sitter space factors, is equivalent to certain conformally invariant quantum field theories.

Our analysis generated conformality. By applying equation 2.4.1 the axioms are statements of not only QFT but also 11-dimensional SUGRA and holography by the AdS/CFT Conjecture. We imply direct causality from stochastic quantization; to superspace; into superstrings.

We simply state a conformal reality: QFT and statistical mechanics can be related by Wick rotation. By shifting as such we state the best avenue of statistical quantization. If statistical quantization is implied we substitute the geometric properties with a numerical, or finite algebraic, approach.

That is the basis of holographic duality: the manifestation of string geometry in the physical sciences is equivalent to the statistical, ergodic, and numerical properties of quantum cosmology [10].

Strings [that include Anti-de Sitter space] $\leftrightarrow$ CFT $\leftrightarrow$ Statistical Quantization

To think in terms of finite geometry is to say that the fundamental goal of new physics is the process toward intelligibility of its architecture. AdS/CFT simplifies physics in a powerful way. Particular features become irrelevant in the scheme of the natural sciences. In this case, with Witten’s domain, we no longer depend on group transformations rather on the categorical nature of abstraction. Though group theory is an essential attribute of basic non-abelian gauge theory we must modify the gauge group from any involvement in coordinate geometry, and in this case, the gauge group is simplified as algebraic properties that are objects of string topology.

We imply that one shifts from Chern-Simons theory [equation 2.3.1] to string topology by applying integrals in the metric space [2.4.1] [11]. We also realize that SUSY is shown by formalism of 2.3.6 and 2.3.7, which goes along, with superalgebra and 11-dimensional supergravity. We state the following axioms for superstrings that includes axiom 7,
We imply that one shifts from Chern-Simons theory \[2.3.1\] to string topology by applying integrals in the metric space \[2.4.1\]. We also realize that SUSY is shown by formalism of 2.3.6 and 2.3.7, which goes along, with superalgebra and 11-dimensional supergravity. We state the following axioms for superstrings that includes axiom 7, axiom 9, and equation 2.4.1:

1. \[\exists p \exists D \to D[p]\]
2. \[\tilde{L}_{\text{min}} \sim 2 \sqrt{\alpha'}\]
3. \[\exists \Psi \text{ s.t. } L_{m,n}(\Psi) = 0, \text{ where } L_{m,n} \text{ are the Virasano generators.}\]
4. \[\exists L_{m,n} \text{ s.t. } [\tilde{L}_m, \tilde{L}_n] = (m-n) \tilde{L}_{m+n} \text{ for string topology.}\]
5. Given \(\Psi(f_1), \Psi(f_2), \ldots, \Psi(f_n)\)

\[\forall f \text{ s.t. } f_n \in \mathbb{R}^n\]

\[\implies <\Omega, \Omega(\Psi(f_1)) \ldots \Omega(\Psi(f_n))>\]

6. \[\exists Z(j) \exists l(\text{parameter}) \exists \Psi \exists L_{m,n} \exists \tilde{L}_{\text{min}} \exists D[p] \to W(l, l) \in \mathbb{R}^\otimes\]

They generalize the central characteristics of quantum gravity and astrophysics. They are in direct relation with the axioms in Section 2.1. Their formalism and indication is distinctive of universality and homology. These axioms form the primary matrix: holographic constraints, in which, the laws of nature are embodiments of the initial state and are not qualities of any other state after inflation.

We must now move along by providing a logistical procedure for Yang-Mills in \(\mathbb{R}^4\).

2.6

Prove that Yang-Mills in \(\mathbb{R}^4\) exist:

\[\pi: E' \to M \text{ where } M \subseteq \mathbb{R}^4\]

\[\text{Hom } [E, t] \to M\]

\[\mathbb{R}^V = F\]

\[\mathbb{R}^\tilde{V} = \tilde{F}\]

\[\| \mathcal{R} \mathbf{v} \|^\frac{2}{r} = < \mathcal{R} \mathbf{v} | \mathcal{R} \mathbf{v} > \text{ Hom, } 1\]

\[= < F | \tilde{F} > \text{ Hom, } 1\]

where \(< F | \tilde{F} > \text{ Hom, } 1 = \sum < \text{Tr } F | \text{Tr } \tilde{F} > E_r^E\]

\[\implies L(\mathbf{v}) = \frac{1}{2} \int \| \mathcal{R} \mathbf{v} \|^\frac{2}{r} \rho\]

\[\implies \frac{1}{2} < \text{Tr } F | \text{Tr } \tilde{F} > \rho\]

\[\implies \| \text{Tr } F \|^2\]
\[ \Rightarrow \text{Tr } F \wedge F \]

We’ve provided a detail logical synopsis demonstrating that there exist a Yang-Mills in \( \mathbb{R}^4 \). Through the principle of least action we’ve shown the consistency of the connections and field strengths. The Langrangian as well, and as implied earlier, is gauge invariant while \( \pi: E \rightarrow M \) is a G-vector bundle with metric \( r \rightarrow <. | .> \) and \( \rho \) is the canonical volume. The Yang-Mills Langragian is the mapping from the set of G-connections on \( \pi: E \rightarrow M \) to \( \mathbb{R}^4 \) where \( R^\nabla \) is the Yang-Mills field [5].

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2.7

Within current algebra why is the vacuum potentially invariant [5]? We’ve stated before in section 2.4 the mass gap. It’s obvious now that the vacuum is invariant because the pions deteriorate into gluons as quark confinement breaks down. In doing so the energy increases while preserving the utility of conservation and vice versa.

Since quarks and gluons share the same mass we infer the following using the Langrangian for quantum chromodynamics:

\begin{align*}
(2.7.1) \quad \mathcal{L} &= \bar{u}D\bar{u} + \bar{d}Dd + \mathcal{L}_{\text{gluons}} \\
(2.7.2) \quad m^\Delta &= D\bar{i} (\bar{u}u + \bar{d}d) \\
(2.7.3) \quad m^\Delta &= \mathcal{L}_{\text{gluons}}
\end{align*}

We can account for current algebra theory for the following Lie-algebra operations:

\begin{align*}
(2.7.4) \quad [\hat{A}, \hat{A}] &= 0 \\
(2.7.5) \quad [\hat{A}, \hat{A}] &= [\hat{A}, \hat{A}] \\
(2.7.6) \quad [\hat{A}, \hat{A}] &= \hat{A}\hat{A} - \hat{A}\hat{A} \\
(2.7.7) \quad [\hat{A}, [\hat{A}, \hat{A}]] + [\hat{A}, [\hat{A}, \hat{A}]] + [\hat{A}, [\hat{A}, \hat{A}]] &= 0
\end{align*}

where \([\cdot, \cdot] : \hat{A} \rightarrow \hat{A} \).
Recap of Such Findings

Overall the mass gap and Yang-Mills problem has been addressed by utilizing finite geometry and the findings produced in an earlier study. It is not to say that there aren’t any further problems that may arise rather that the conjecture has been shown to be formidable. Further studies in the area of 11-dimensional supergravity may yield newer insights into the mathematical machinery, but in all else, we have generated the axioms of both QFT and string topology. These axioms are central in understanding the interface between high-energy physics and physical cosmology. The relationship between the two leads to the primary matrix that incorporates both the axioms in section 2.1 and 2.5.

It is in many respects that holography substitutes any geometric consideration with algebraic properties. That holography reflects, in the process toward quantum gravity, that certain characteristics are irrelevant in such schematics. We no longer consider all basic features rather to include primary elements that are more intrinsic to the natural world, and in many respects, those discarded maybe better described by more considerate attributes.

Yang Mills in $\mathbb{R}^4$ is unique in a subtle way: standard Yang-Mills doesn’t allow for fermionic particles yet Yang-Mills in $\mathbb{R}^4$, as indicated in section 2.3, includes both fermionic and bosonic particles. Yet as the conjecture was stated in section 1.2 the lowest excitations yielded the mass gap shown in section 2.4 where we apply the Wilson operator of the holographic constraint. The lowest excitation of non-abelian gauge theory gave the value of the mass gap. Incorporating the Wilson operator we use the energy state to determine the mass of lightest particle. By such procedure we were able to differentiate between the mass of lightest particle and the vacuum state of bosonic interactions.

The relationship between QFT and string topology is demonstrated with two processes: the AdS/CFT Conjecture and the Super-Yang-Mills analog. Such characteristics were first shown in the Logical Structure of Space-Time before a more general idea was formulated in the application of the mass gap and Yang-Mills conjecture. Further explanations gathered express the nature of quark confinement, the nuclear force, and current algebra. There may lie, in the spectrum, further questions that may not have been addressed.

In all else the relationship between all areas of mathematical physics demonstrated the intricate relationship between different specialized fields of mathematics and that the inclusion of finite super-geometry led to the resolution of the QFT conjecture.

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3.2

The physicalist program is a statement of both incorporating different elements of the physical sciences and in pursuing the most general explanations for physical phenomena. Once the laws of nature are classified the next phase is to limit the features that implicate those particular laws. Incorporating various characteristics within the scientific domain it would be best to catalogue those theories in the natural sciences that the simplest description modifies whatever explanation is best defined. Though strings and universality provides a final and coherent explanation of quantum gravity it is no less abstract.

It is to limit the mathematical and physical properties in such a way the best explanation can incorporate the most profound and sophisticated mathematical and scientific definitions into a singular unit that can be utilized without qualifications.

The program is designed to include every level of specialized fields into what is best stated as polymathematics.

As unification has been the program in physics since Albert Einstein the physicalist program is an effort that must, as well, be undertaking with immense collaboration.

Within every field of natural sciences the physicalist program must find a relevant and detailed, “description” of such theories that a logical and empirical framework is established. The framework would expand the horizon for any new physics that may lie dormant, i.e. previous theories are easily implemented resulting in new physics that easily clarifies itself.

Only in the next few decades and centuries will the natural sciences finally be solidified that gives the most exhaustive and clearest description of the natural world. It is not about excluding specialized areas rather it is about including those
areas without specialization. In such a way the key to the natural sciences is finally open to anything that desires to find it and to seek the best avenue for efficient applications and any incorporation of distant theories that utilizes earlier findings.
Conclusion

Stating the axioms and the definition for QFT we propose an solution to the Millennium Prize Problem establish by the Clay Mathematics Institute. The current research findings has yielded implications for further analysis and exploration. It may be that longer studies may yield a more accurate avenue for the Yang-Mills and the Mass Gap problem but we hope that the formulation produced in this paper may contribute to the ongoing debate.
References


