Infinite Particle Physics

Chapter 11 – Philosophical Ruminations

One must be frivolous to think of new things;
One must be serious to make something of them! Ergo,
A successful theorist is a schizophrenic, manic-depressive!

The incentive which impels an outsider to work on a revolutionary new theory of physics is hard to explain to wife, friends, and neighbors. You appear to them like Thadeus P. Toad, all aflutter with curious ideas which make no sense at all! You have no job, no contract with the government, no support from any foundation, no affiliation with any university; in fact you have no legitimacy whatsoever! If your wife loves you, as mine does, and is able to keep house and finances in order while you spend money on fancy computers, and squander your time on one false lead after another, you are indeed lucky! And, if you actually achieve something noteworthy, and start crowing about it, you are blessed beyond measure, if she refuses to call the local nut house to have you put away!

The Role of Outsiders in Science

An outsider is anyone interested in a field of science for which he is academically unqualified. Insiders consider outsiders a plague of locusts, incessantly buzzing around, consuming valuable time spent in squashing them. Even when outsiders contribute something of value, insiders are annoyed. "Hell, this idea isn't new! I've thought of many times, but never got around to writing it down!"

Corrective Feedback for Loners

When one works alone, with no chance to try out creative ideas on friends and associates, the only corrective influence is time. An enchanting idea must not only outshine all its contemporary alternatives, but must continue to glow in the light of repeated appraisals.

Encouragement for Loner-Heretics

Encouragement for loner-heretics comes in the form of rebuffs! You get these, simply by talking about your radical ideas. If I had needed this kind of encouragement, I could have obtained rebuffs every day of the twenty-eight years of this investigation, simply by informing some physicist of my book's thesis. I'm not *that* much of a masochist, but this opportunity exists, because there is a heap of hubris in the hallowed halls of High-Energy Physics! Please do not interpret this as criticism — there is plenty of justification for these hallowed people to feel superior. And these rebuffs were useful to me, for they showed me how different my engineering type mind is from that of a mathematical physicist, and what a huge chasm I must bridge to gain an audience for my ether theory.

Definition of a Theory

A theory is an ordered series of concepts gleaned from a colossal clutter of creative ideas. You pluck the fruit of truth atop a rubble pile of discarded notions!

Creating Theories

The creation of a new theory is a multi-stage process, passed on from one individual to another. I view my role as snatching ideas from the formless void, and arranging them to tell a story which is meaningful to *me*. Whether these ideas become a theory is beyond my control — only my successors will determine this!

Theoretical Advancements

Any new theory advances in cogency by successive purges of misconceptions. At any stage in its development, it will contain flaws. When these are discovered, a defender of the status quo breathes a sigh of relief — but so does a proponent of the theory! Solve this flaw, and the theory is greatly strengthened!

How a New Theory Evolves

Understanding complex phenomena requires the mental agility to leap back and forth among the components of partial comprehension until some new, and higher, gestalt emerges. Often the list of components necessary for the gestalt is not complete, or, if complete, is not comprehended with equal clarity. Frequently knowledge of one component is vital to understanding another, so a serial approach is required. The worst case is one in which all the components of partial comprehension need to be understood in order to understand any of them. Here, one may need to learn in a circular manner, overcoming unclarity gradually by repeated visits, and the serial order of these visits may not have much significance.

This latter mode of activity is, of course, the way any theoretical advance is made. You stew over a motley bunch of half-baked ideas, perhaps for years, until some begin to please you, and you work with these until they begin to cluster into family relationships. Numerous gestalts will then begin to occur, most of them only temporarily appealing, until some idea suddenly blinds you with its potential brilliance. It is still only half-baked, but you *know* it will work out!

And it does — but it may still take years to find all the ancillary ideas that make a case compelling enough to publish.

Theoretical Moods

Any theoretician progresses from perception to exception to rejection to dejection, from hunch to crunch to lunch, from soaring to boring to snoring, from elation to conflation to deflation to vacation, and from zoom to gloom to tomb!

What We Learn from Wives

Unless you are married to a physicist or an engineer, you are aware that your wife hasn't the slightest interest in your latest technical insight. Nor is she even slightly intimidated by the vast knowledge you possess; but, rather, she feels it is necessary to instruct you step-by-step in every household activity you do for her. Of course, you are doing this task for her, because you are so much better at technical things, like gluing the broken chair, putting a new plug on the old lamp, cleaning out the gutters, feeding the cat, or taking out the garbage. And you are like putty in her hands, because it *really is true* — you *are better* at technical things, and you are immensely flattered that she acknowledges this — and she rarely watches to see whether you were guided by her advice, so her suggestions were only temporarily irritating! You can even remember a few instances where she was right, and you had to do it over again — her way! Marry by all means — it will keep you humble!

Here's how I would have begun my book, if I could have finished it during the period of Brand-X TV ads (and was in a manic phase!):

A Brand-X Theory of Particles

You and I are going to have some fun! We are going to develop the *cheapest* theory of particles. Our Brand-X theory is going to scrimp on raw materials, and economize on phenomena. We'll use very little mathematics, because our cheap theory can get along with practically none.

Our raw material will be the American ether, or the English aether — it's immaterial! And cheap! In fact, there is an infinite amount available, so it's cost is exactly *zero!*

Our basic phenomenon (yes, we require only <u>one</u>) will be infinitely-extending dynamic lattice-distortion patterns in a bipolar ether comprised of opposite-polarity elemental charge entities.

Our objective will be to prove that our Brand-X Theory, while incredibly cheap, is not only as *good* as current brands, but is actually superior to any other brand on the market. Whereas other brands are incapable of retaining *causes* in the fabric of physics, Brand-X actually makes them stand out with incredible clarity! Brand-X also brings out hidden patterns in the fabric, like gravity, mass, spin, fields & forces, which other brands have obscured.

So buy now! You'll be glad you switched!

About Choosing a Title for this Book

During the formative years of my theory, when the word, "ether", was the kiss-of-death for any physics publication, I spent idle moments brainstorming alternative title ideas skirting the dreaded word! Here are some of these which I deemed worth keeping:

Exploring the Roots of Physics
Why Phenomena Occur
Why Physics Happens
The Why of Physical Phenomena

The Roots of Physical Phenomena
A Binary Universe
A Binary Concept of Physics
The Lord's Dice Had Just Two Faces
A Yin-Yang Microcosm
Yin-Yang Updated
Yin-Yang Particle Physics
A Two-Bit Theory of Particles
Parsimonious Particle Physics
Making Do With Two
Everything From Nothing
How To Visualize Microphysical Processes
How the Wee World Works Its Wondrous Ways
Don't Let Mathematics Bound Our Imaginations!
How To Economize On Fundamental Particles
Kindergarten Particle Physics
The Geometry of Particle Interactions
A Mechanical Model For Microphysics
The Architecture of Physical Phenomena
A Mechanical Model For Quantum And Particle Physics
Probing The Architecture Of The Microcosm
Probing the Roots of Physical Phenomena
The What, Why, and How of Physics
Freeing Physics From The Prison Of Mathematics
Adding What, Why, & How to How-Much
To Understand Physics, Take a Whiff of Ether

Did Fred Hoyle's, The Black Cloud, Play a Part?

A small group of scientists, in Fred Hoyle's *The Black Cloud*, have established temporary dominance over the entire world by being the only group able to communicate with a huge cloud surrounding our sun, whose shadow threatens to freeze the earth's people. They have learned that the "cloud" is a sentient being of vastly superior intelligence, of incorruptible rationality, very busy with its own affairs, but apparently willing to impart some of its advanced physical knowledge to them.

You know the rest — the "bright boy" volunteers first to sit in front of the apparatus designed by the cloud. He is entranced, mesmerized, immobilized, as new patterns of understanding envelope his mind, creating a wild storm of thoughts so irresistible, and yet so destabilizing to his scientific indoctrination, that he is overcome with "brain fever", and dies.

Who will be next, after this outcome? Only, Chris, the leader of the Group! He has a scheme to avert the same fate: he will ask the "cloud" to go slower, and resolves not to contest the "cloud's" concepts, but will just subordinate his own beliefs whenever there is a conflict. The scheme almost works, but, in the end, Chris finds himself in an intolerable state, where the two irreconcilable viewpoints cannot be kept in separate compartments, but merge and destroy his brain. Just before the end, he has a moment of sanity, and observes, "The height of irony is that I should experience this singular disaster, while someone like Joe Stoddard (the simple-minded estate gardener) would have been quite all right!"

So what led Hoyle, in 1957, to imply that our current understanding of the cosmos was vulnerable to drastic reformulation? Was it the flack he was getting from Big Bang proponents over his Steady-State Universe postulate? Or did he perceive that Quantum Mechanics was so divorced from common sense, that its proponents would be completely unnerved to find that there was, after all, a common sense way of reconciling all its odd, contradictory aspects? Surely the knowledge imparted by the cloud was not the "Equation of Everything", because that insight would merely have produced a smile of understanding, undergirded with envy! No, to have induced a brain-damaging fever, the Cloud's information must have been truly revolutionary — something that inverted all the scientist's perceptions about the microcosm. The most logical inference we can make is that the Cloud imparted something revolutionary about the characteristics of space, itself, since his organism spread into trillions of cubic kilometers of it. Perhaps the Cloud suggested that space was actually an unimaginably dense crystal of two elemental charge entities, and then showed how all known phenomena derived from the interactions of just these two elementary particles. Would that insight be mind-boggling enough to destroy a physicist's brain?

Had this powerful imagery of Hoyle's 1957 novel created a latent predisposition toward space-lattice theories in my mind, ready to be ignited by a chance *Scientific American* article? I don't know! But I would like to think that IPP is according to Hoyle!

Preserving Equanimity When Faced with Rejection

We heretics, nowadays, have a much easier life than was true in the Middle Ages, when you were burnt at the stake, or placed under lifetime house arrest. But it is, nevertheless, painful to the ego to spend hours on personal letters to numerous prominent physicists and cosmologists, describing your accomplishments, only to receive perhaps three or four replies out of over a hundred, and these replies rather non-committal. When you know you are *right*, this is baffling! But one can rationalize this rejection by philosophical rumination on the diverse nature of minds, as follows:

Different Minds, Different Thoughts!

Every observant person has noticed that minds are as idiosyncratic as faces, or figures. Some are sharp and quick, some vague and slow, some are reflective and involute, others dynamic and decisive. In each of these types, we also find differences in proclivity, emphasis, and, to choose a modern metaphor, "programming". Although any particular mind defies complete characterization, we recognize certain types — artistic, literary, pragmatic, mechanistic, mathematical, inventive, pedantic, legalistic, humanistic, and so on.

These differences lend excitement to life, but they also lead to many problems. When exposed to the same learning situation, we absorb different things, reach different conclusions, and act in different ways. And when we view the actions of others, we tend to think of them as "right", or "wrong", depending whether they are consonant, or antagonistic to our own impulses. Ultimately, then, it is the tug and pull of these value judgments which shape the course of cooperative human behavior. Whether an activity is sacred or secular, business or academic, productive or hedonistic, pseudo or scientific, little can be accomplished unless the participants have similar backgrounds and thinking processes. Without this commonality, their efforts will be dissipated in argument, strife, and bitterness.

Thus, the urge to accomplish *something*, rather than *nothing*, leads inexorably to mind-selecting processes in all major human activities. These processes are, at first, informal and competitive, with much soul-searching and experimentation, and with numerous sub-groups bidding for supremacy. Each sub-group strives to define a paradigm for the activity which will enlist the maximum number to its cause, hoping, thereby, to achieve dominance, so that the emphasis can shift from politics to useful activity. If this paradigm is skillfully chosen, a variety of mind-types can be active toward the group goals, but it is never possible to define the activity so that all mind-types will be able to, or want to, participate. And, indeed, it would be undesirable to include too many mind-types, since differences create disagreements, and disagreements slow the pace of the work.

As one group achieves dominance, the excluded participants in the original quest either switch to other pursuits, or continue to advance their divergent views, earning the opprobrium of their erstwhile associates, and, eventually, if they persist, being treated as heretics. Either way, their competitive concepts of the paradigm are not promulgated, and gradually fade from view. Not only is this true, but through control of the pedagogy, the dominant group will tend to pass on mainly those aspects of its paradigm which have proven most productive, thereby both narrowing the range of acceptable pursuits, and also further delimiting the mind-types who find the field possible and challenging.

What finally prevails in any mature group activity is a professional class of participants with a relative narrow range of mind-types, who are predisposed to, and specially indoctrinated in, a narrowly defined paradigm which is assumed by them to encompass all desirable investigations and explorations, present and future. This limited purview can be highly successful in ethical, literary, and artistic fields, and even in science, so long as the phenomena under consideration are consonant with the mental processes of the participants. However, since Nature's bounty is unlimited, and man is clearly not omniscient, it is inevitable that moments of bafflement will eventually arrive which appear insoluble to the specially selected mind-types who comprise the professional cadre.

These moments of bafflement are common in scientific work, and quite often the pessimism which ensues proves to be unfounded, when renewed effort and new approaches vanquish the supposed "insoluble" problem. Successes have been often enough, in fact, that even long-standing and seemingly intractable problems acquire a patina of pregnant possibilities in the ambience of other "impossible" breakthroughs. But breakthrough don't always happen! Some problems resist explication by the entire community of scientists for decades, seemingly placing the group's paradigm in jeopardy!

One would think, at this point, that these scientists would seek assistance from proponents of alternative paradigms. Perhaps the narrowed focus of the reigning paradigm was unwise? Perhaps the intractable problem would become intelligible, if it were viewed from a radically different perspective? Alas, perish these heretical thoughts! It is much easier to sweep these niggling difficulties under the rug, and just work on problems that *have* solutions! If the rug gets too lumpy, just get a bigger rug!

Meanwhile, this rug debris, while cleverly rationalized away by the specialists, becomes fascinating to other mind-types, especially to those excluded during the period of paradigm squabble. Maybe this is their day in court; find solutions for the intractable problems under the rug, and surely the reigning paradigmists will listen! I have sad news for these out-of-favor mind-types: *don't count on it!* From the perspective of reigning paradigmists, solving "rug" problems is impossible; hence, anyone who claims to have done so is clearly a *fool*, whom all reigning paradigmists should (and will) ignore!

Mathematical-Type Minds vs. Engineering-Type Minds

At the root of the differences in the thought processes between mathematicians and engineers are the different goals they seek. The mathematician is interested in *generalities*, the engineer in *specifics*. Thus, M is concerned with *procedures*, while E must be concerned with *details*. They also pursue their goals differently:

M plunges into the water, heading north, for example, and swims under water with his eyes tightly closed, until he arrives at his destination. He has faith that, providing every stroke is precisely determined, and his inertial guidance system is working, he will emerge in a glorious place, one fully worthy of his efforts. A certain serendipity is hoped for, since his effort would be useless if he already knew precisely where he would emerge.

E, on the other hand, must choose his destination *before* getting in the water, must swim on the turbulent surface, fighting the wind and waves, dodging flotsam and jetsam, and must keep his destination ever in sight, through blinding reflections and irritating salt spray. If his strength is adequate, and his goal is not an hallucination or a mirage, he knows precisely what to expect at his destination.

To achieve outstanding success in either field, a high degree of imagination, technical mastery, discipline, and fortitude is essential, and luck and Divine Guidance are most welcome. But imagination^{M} is not imagination^{E}, just as skill^{M} is not skill^{E}. The mathematician's imagination is poly-dimensional, and poly-chromatic, while the engineer's imagination must be in 3-dimensions, and in living technicolor. M's thoughts have no boundaries, and his visions are not limited to the real universe, while E's thoughts are confined to real-world *possibilities*, and his mental pictures must exclude the impossible and the impractical. M seeks universality, elegance, and congruence; E seeks utility, appeal, and functionality.

The many differences in thought processes may suggest why there is a love-hate relationship, *sotto voce*, but nevertheless real, between mathematicians and engineers. The epithets vary, but "ivory-domed theorists" vs. "bone-headed empiricists" captures the essence. Neither group really understands how the other is able to get satisfaction from its activities, nor can one group fully comprehend the thought processes necessary for success of the other.

What engenders this mutual animus — when it is readily apparent to both groups that scientific understanding is vitally dependent on both activities? My answer, now painfully apparent to you, is that we are both victims of our happenstance mental programming, most of which took place in early childhood. Each group is innocent of any malice — they are both just doing what comes naturally!

What *has* become a serious difficulty, however, is that mathematicians have become *custodians* of the Temple of Knowledge, and *keepers* of the Sacred Scrolls. *They* decide what information needs to be preserved, and what language the scrolls are to be kept in. We should not be surprised that this language is *mathematics*, and that they take delight in making the scrolls incomprehensible to practical minds. Incomprehensibility has always been the goal of Keepers of the Sacred Scrolls — it enhances our awe of them, and dissuades us from invading their territory!

So, engineers, heed the words of the French revolutionaries: Come children of our profession! To arms! Form your battle groups! March on, march on! Despite your impure blood, take your rightful place in Physics! It needs your contributions!

A Change of Scene to a Lighter Vein

I got rather serious, there, for a while. Sorry! Perhaps, the following will atone for my sins:

ARE THERE DEFECTS IN YOUR FUTURE?

This is for students, breaking symmetries,
Whose moving particles have wave disease,
Whose waves have Planck-containing energies,
Whose cats must hope decaying atoms freeze!
This is for you, whose probabilities
Lie drenched in deep dichotomies,
Whose math, all filled with psi's and phi's,
Needs deft, renormalized infinities.
You've toiled for years to reach a certain ease
In digging deep within your QCD's
To calculate the mass, and such, of Z's.
You've mastered these particularities —
You have upon your wall advanced degrees —
You have the time to dwell on fantasies —
What don't you have? *The cause of all of these!*

To you, who're tired of mastering this expertise,
And yearn to find out what's behind these vagaries,
Who've failed to see the forest, studying the trees,
I offer solace — in the realm of E-C-E's!
My particles are defect-cluster entities,
That stretch through space beyond the distant galaxies,
And have, built-in, those wave and spin propensities
Which scholars need, to explicate dualities.
My forces are created by asymmetries —
I need no vector-particle complexities —
My mass and energy both correlate with squeeze,
Mere shrinkage zones of higher lattice densities,
And, as for calculating masses, it's a breeze!
So, if you're ripe for elemental verities,
Just read this book — but take it slowly, if you please!

Newton

There once was a fellow named Newton,
Whose thinking was quite high-fallutin'!

He worked without pause
To achieve his three laws —
While his friends spent the plague-years just hootin'!

This Newton, whose name was Isaac,
Invented math far from prosaic!
That planets all moved
In ellipses, he proved
By reasoning quite integraic!

When they asked him why apples fell down,
He replied, "To whack you on your crown!
"If an apple fell up,
"You'd have no fruit for sup!"
Now you see why he had great renown.

Einstein

An Einstein named Albert was subtle,
And smiled when he offered rebuttal:
"Don't you know", he would say,
"That the moon's here to stay!
"It won't vanish when you look at Tuttle!"

He did his best work in his prime.
His really best work was with time:
"Our time is askew,
"Good for me, bad for you,
"When you rocket away *from our clime!"*
He jousted with Bohr and his clan,
And argued each case with élan —
Though cleverly pleaded,
He never succeeded
In proving his point to that man!

Sources of Inspiration

Newton stood on the shoulders of Giants. Einstein contemplated trolley-cars and elevators. Your author rummaged around in the dustbins of physics, looking under rumpled rugs.

Dick

There once was a fellow named Dick,
Whose mind was unusually quick —
But he frittered away
All his talents, they say,
On a theory that made people sick.

His idea of Nature was curious —
She was, to his mind, quite penurious.
"Why opt for more stuff,
"When two bits are enough?
"Any more, and I would have been furious!"

He struggled for twenty-eight years,
Leaving much of his life in arrears,
But he triumphed at last,
And gave credit, if asked,
"It's because of those physicists' jeers!"
If you ask if he had any fun,
He replies, "Of your kind, nearly none!
"But, of course, I had pleasure
"In taking God's measure,
"And seeing how <u>His</u> work was done!"

Concerning Hard-to-Swallow Metaphors of QCD

There are facets of Quantum Chromodynamics (QCD) which strain our credulity. Let me have a little fun in bringing these to your attention, by pretending that I am trying to explain QCD to a precocious ten-year old.

QCD FOR TEN-YEAR-OLDS

"Everything we see — the earth, the air, the stars, we, ourselves, and all the objects around us — are composed of only four kinds of things: lepton particles, quark particles, force particles, and energy particles. Each of these has a large family:

Lepton family -------- 12 members
Quark family --------- 36 members
Force particles ------- 13, at least, needed, many more postulated
Energy particles ----- infinite number

"I know this is a big list, but many individuals in the same family are rather similar, so I won't take as long as you might expect to explain all of them!

"For example, let's look at the lightest charged member of the lepton family, the electron. Electrons are tiny, point-like things that spin around like a top, and have a charge like a strange battery with only one end. Though they seem simple, electrons behave in puzzling ways. They swirl around the nucleus of atoms all spread out like a cloud of smoke, until something excites them. Then, they form a larger cloud of smoke, which quickly gives off a particle of light, and becomes a small cloud again. When electrons go through a small hole, they somehow *interfere with themselves*, and don't end up where we thought they were going. When we make them go very fast in those big particle accelerators, they gain so much weight that they get heavier than a large atom!

"Quarks, like electrons, are tiny points that spin like a top, and have a charge like a battery with one end, but, even though they are the same size as an electron, quarks weigh from ten to ten-thousand times as much, depending on their "flavor". Another funny thing is that the twelve lightest quarks come in only two sizes, u-quarks, which have a charge like the upper two-thirds of a battery, and d-quarks, which have a charge like the bottom one-third of a battery. There's a reason why these two quarks have fractional charges: it makes everything come out right! Put two u-quarks, and one d-quark together and they make a proton which has a charge like the full plus end of a battery, and if you join together two d-quarks and one u-quark to make a neutron, the charges cancel out, making the neutron like a completely worn out battery with no charge. All this may sound a little strange, but what is even more astounding is that these fractional charges of the proton's three quarks add to *exactly* the same amount as the opposite charge of the electron, and the three quark charges of the neutron add to *exactly* zero. Who can believe that quarks can divide by three, accurate to seventeen decimal places, or so? That's really being good at math!

"If you've ever tried to hold a bunch of plastic ribbons, you know that they tend to fly off in all direction. We explain this by saying that they are all charged the same, and *like charges repel!* You might wonder why two u-quarks can stay together in a proton; physicists wondered, too, and finally discovered an answer that is fantastic! Here it is:

"They found that quarks like to juggle! Three quarks play with three little sticky things called gluons (there are actually eight kinds of these available, but no quark is allowed to play with all of them), which they toss back and forth to each other. Pretty skillful isn't it. And, what is even more remarkable, the gluons aren't there until they throw them, and every time one quark throws a gluon, he changes color. And every time a quark catches a gluon, *she* changes color. How do they know what color to change to? Simple! A gluon is a color messenger, like Western Union! What happens if the three quarks don't toss and catch their gluons together at the same time, and in the right directions, and what if they grab the wrong color? You're too young, and not ready for that yet! Anyway, the three quarks are so clever that they can toss and catch gluons all day long, and no matter how many times each quark changes color, their three individual colors *always*, and, *at every instant*, blend together to make white. Also, you see, don't you, that if they juggle all the time, they'll have to stay close together? Now isn't that a simple way to explain why three quarks stay together forever and ever!

"It would be nice if things had stayed this simple, but physicists made many machines that hurled protons and electrons very vigorously at targets, and even at each other, and things got very complicated. They discovered that there were not just three particles, but *hundreds* of different particles, and for each one of *these* particles there was one *really weird* particle that was exactly like the first, only *completely opposite*, sort of like your photograph compared with the negative that made it. Physicists call these two groups, *real matter*, and *anti-matter*, so we'll just call them *REAL* and *ANTI*.

"REAL and ANTI particles don't just dislike each other; they *hate* each other, and whenever they meet, they completely destroy each other! If a REAL proton, made up of three REAL quarks, meets up with an ANTI proton, made up of three ANTI quarks, you get a big poof, and everything disappears. Not instantly, because when a REAL quark meets up with an ANTI quark, they don't fight, but join together peaceably to form a meson. But they *really* aren't happy together, because they split up very quickly into pure energy, or into REAL AND ANTI leptons, which destroy each other to produce pure energy — and a few nothings, called neutrinos, are the only things left to show that the two big particles were once here, and *they* zoom away at the speed of light!

"When physicists were faced with the problem of explaining why there are so many particles, they saw that they could explain the lighter ones just by assuming that each "flavor" of quark came in three different colors. Then when heavier particles were discovered, they found that they had to add three more "flavors" of quarks to explain them. These additional quarks were named s, c, b, and a t-quark was added, because physicists thought quarks should come in two's, just like Noah's animals. These extra quarks were also good at math, because the s-quark and b-quark has *exactly* the same charge as the d-quark, while the c-quark and presumably the t-quark has *exactly* the same charge as the u-quark. I say, presumably, because the t-quark, though recently discovered, is too new to know what charge it has.

"As physicists learned more about the heavy quarks, they discovered another way in which quarks are very smart. Although these quarks weigh a lot more than the u and d, it doesn't take any more effort to stop them from rotating because they all have the same amount of spin. Imagine, if you will, a group of ice skaters. Most are slender, but some are *extremely* fat! As you watch them, spinning around, you notice that the fat ones are spinning much more slowly than the skinny ones. You ask them why, and they all speak up at once: "It's our nature! We all use *exactly* the same amount of energy to start spinning -- we always have, always will!"

"But even with half a dozen quarks, each in three different colors and in both REAL and ANTI forms, physicists couldn't find enough combinations to explain all the particles they had found; so they speculated that perhaps quarks, like people, get excited, and spin more violently, and make bigger clusters that weigh more. And they were very gratified to discover that this last idea was all they needed to "quarkify" all the particles which have been discovered.

"As you might expect, getting excited is not the same for quarks, as it is for us. Quarks have to be very careful to speed up their spins only in jumps; they can't rev up like your car engine, but they are, rather, like a car engine that lets you go only 5, 15, 25, 35, ... mph, or, if your car is a truck, maybe only 1, 3, 5, 7,....mph. And these speeds have to be *exactly scaled*, to the particular weight of your vehicle! Well, we *know* that quarks really do behave this way, but, in the lab, it is hard to find convincing evidence. This is because quarks are not only smart -- they are *playful*! They like to change from one kind to another, or one spin state to another, so fast, and so often, that the unsuspecting physicists see them as a blur, or a mixture. However, it is easy to find out what is going on. All the physicist needs to do is to calculate what percentage of the time the quarks are in each of their playful states!

"Incidentally, don't try to picture the proton, or neutron, as a solid object. No matter how they are arranged, three infinitesimal dots will always lie in a single plane, and a single plane can fill no volume, whatsoever! Yet we know that the three quarks are definitely there, because we can bounce things off of them. Weird! It's all very puzzling, so let's return to the lepton particles.

"Leptons come in two types, those with no charge, which we will call "Nothings", and those which are fully charged, which we will call "Chargies". There are six kinds of each type, half being REAL, and half ANTI.

"Nothings are the closest thing to nothing that we know about. A zillion go through your body every day, and you may think that they should, over time, punch you full of a gazillion holes, but Nothings are so small, and you are so full of empty space anyway, that they almost never hit anything at all! No one has ever seen a Nothing, but physicists know that the six Nothings come in three different sizes, three REAL ones which spiral through you like a left-handed screw, and three ANTI ones which spiral through you, as expected, like a right-handed screw ─ or *is it the other way around?* I've always been puzzled by these nothings knowing which way to spin, because both REAL & ANTI *chargies* actually spin *both* ways!

"Chargies don't pal around, like quarks, but always keep their distance -- *if* their ends have the same charge. Those with opposite charge ends rush quickly towards each other and then simply disappear, so I guess they don't like each other, either.

"The smallest REAL Chargies, electrons, are always loners, but the two larger Chargies like to pal around with Nothings and smaller Chargies; however, they are very secretive about their relationships, and keep everything well hidden, probably in a pouch like a kangaroo. What they carry varies a lot from Chargie to Chargie, but one thing they always carry is a Nothing of their same class. Of course, a Chargie will never tell you what he is carrying, but, since he is very shy, if you watch him long enough he will simply explode with embarrassment, and thereby reveal his hidden buddies, but this is so hard on the Chargie, he simply disappears!

"Take a medium REAL Chargie, for example. When *he* explodes in a couple millionths of a second, we find that 99 times out of a 100 he was carrying a medium REAL Nothing, a small REAL Chargie, and a small ANTI Nothing. About one percent of the medium REAL Chargies, however, carry these three things, *plus* a jagged thing called a gamma. And although it's a little hard to be sure, we think that some five-percent of the medium REAL Chargies get their signals crossed, and carry a medium ANTI Nothing and a small REAL Nothing, instead, and we're very angry with them, because they failed to *conserve Lepton Number*! This is as bad as not flossing your teeth before retiring!

"A big Chargie, called the tau, is about 17 times heavier than a medium Chargie, which is about 200 times heavier than a small Chargie. Tau's break up in about three ten-trillionths of a second, and are full of surprises! In addition to the big REAL Nothing that all big REAL Chargies carry, some carry a small REAL Chargie and a small ANTI Nothing, others carry a medium REAL Chargie and a medium ANTI Nothing. Yet, two-thirds of the time we find they're carrying something *completely* different, groups of REAL quarks and ANTI quarks, and these can be in several dozen different mixtures. The tau is definitely not as smart as a quark, because it doesn't even seem to know what family it belongs to!

"From what we've already discussed, you probably think that quarks are very talented, but they can do much more! For example, while they're juggling gluons, they are also manufacturing, throwing out, and catching all the other kinds of "force particles". They throw out and catch virtual photons, which are not to be confused with real photons, but which, instead, cause other quarks, and leptons, to be *attracted* to them, or *repelled*, depending, I guess, on the sort of message the Western Union guy delivers. And, of course, leptons have the ability to reciprocate these attentions.

"Both quarks and leptons produce gravity particles, called "gravitons", which they send to, and receive from, all other particles in the universe. Imagine the skill required to weigh yourself, determine from this how many gravitons to manufacture per second, and send these out in a perfectly uniform pattern in all directions. While doing this, you must catch all incoming gravitons, and swim in the direction of, and against the current of, their greatest density, your swimming effort determined by your mathematical ability to assess the integral of all these bombarding particles.

"Quarks even have extrasensory perception! Quarks in protons and neutrons can sense when they are near, and start to exchange gluons with each other. By passing gluons back and forth, groups of protons and neutrons bind each other together to form the nuclei of atoms. Physicists call this process "the strong force".

"Now we come to an extraordinary virtual particle, the W particle, or "weakon". A quark can produce one, to suit various desired ends, in either plus or minus forms. A weakon is several thousand times as heavy as the quark which produces it, so you can see that producing one is quite a feat! And very useful, too, if a quark gets tired of looking the same all the time, and wants a face lift!

"Let's say a d-quark in a neutron gets fed up with life, wants to become a bigger guy in the community, wants to be a positive, rather than a negative, influence on his associates. He works frantically, generating lots of horsepower, and with superquarky effort produces a minus weakon, which, is really hard, because it requires three times as much negative charge as he possesses, himself, and weighs maybe eight thousand times as much as he does. Well, after about fifteen minutes, he's finished, and boots out his masterpiece, which immediately splits apart into two of the lightest things known, an electron and an ANTI Nothing. If he had only known how to make these easy products, he could have saved himself a hernia! But, and this is important, he did achieve his objective, because:

$$-1/3 - (-1) = +2/3$$

And he, alone, changed his group from a nothing neutron into a positive proton!

"But, if you think changing an isolated neutron into a proton is hard work, just imagine the dedication required of an upwardly mobile d-quark in a medium sized nucleus, like potassium 40! He is evidently so busy deciding what color of gluon to make and send to surrounding nucleons that he constantly loses his place in his weakon project, for, instead of fifteen minutes, it takes him a billion years to change his neutron group into a proton. Now *that's* frustration!

"The last three "force particles" are the plus, minus, and neutral higgs bosons, which may or may not be implicated in the creation process of the W & Z particles, and perhaps some others. None has been found experimentally as yet.

"You want to know why there are an infinite number of particles in the photon family? We owe this understanding to two physicists, Planck and Einstein. Planck discovered that light appears to exist in little packets, or quanta, whose energy times its wavelength is a constant, and Einstein showed that the photo-electric effect made sense only if light consists of particles. Since light can have any wavelength, there can't be just one kind of photon particle, but, instead, photons must exist in an infinite variety of particles. The only way to avoid this conclusion is to admit that a "particle" of light is not a particle, but merely a moving packet of oscillations involving the interacting elemental charge entities comprising the infinite polycrystalline lattice of space."

Some Thoughts on the Value of IPP to Society

"In conclusion", the boring speaker says, after he has severely tested our ability to stay awake, "I want to thank all of you for your restraint! I know my message has raised your hackles and blood pressure, offended your dignity, and, perhaps, curdled your milk of human kindness. New ideas are always disturbing, and particularly so, when they question the very foundation of centuries-old thought patterns. I feel very lucky not to have been ridden out of town on a rail, dripping tar and feathers, for, in truth, my message is not nearly as secure as I have proclaimed it. Consider these points:

"IPP *does not have* the potential of superseding the mathematical quantum theory of atoms, nor the mathematical theory of the electron, QED. All it can achieve is to explain many of the items which these theories have given up on, as too mysterious to have explanations. Although IPP provides much more plausible explanations of what particles, energy, fields, and forces *are*, than QCD, it offers *no* alternative to the currently adequate scheme of mathematical analysis of the dynamics of particle trajectories. While I fully expect IPP to supersede QCD, much effort will need to be expended (by other mind-types) to adapt IPP concepts to the analysis of high-energy particle experiments.

"Now, having voiced all these disclaimers, I don't want you to *underestimate* the value that IPP may bring to our society. Ever since Einstein's Special & General Theories of Relativity became the epitome of intellectual achievement, the opinion molders of world culture have utilized the *concept* of relativity, divorced from its scientific meaning, as a means of subverting our European and Christian heritage of individualism, property rights, and free markets. We have gone from an ethic of hard work = achievement, to "what's the easiest way to get by!" From personal integrity, to "all things are equivalent, hence no value is superior to any other". Just criticism of behavior is deflected by the glib phrase, "everything is relative"!

"Likewise, the Uncertainty Principle of Quantum Mechanics has sauntered into the common vernacular as a means of justifying fuzzy thinking, since "we can never know anything for sure"!

"So what might an understanding of IPP contribute to alleviating this malaise? *Answer:* IPP brings back the concept of "absolute"! It is premised upon an *absolute* space. It shows one that *nothing* in physics *occurs spontaneously*, that all things have *causes*, and that we humans are intelligent enough to discover what these cause are! It offers explanations for Heisenberg's "uncertainty", and for Einstein's "relativity", for spin, mass, conservation of energy, wave-particle duality, particle decays, fields, forces, gravity, particle charges, including why some particles have zero charge. And, foremost, it permits us to form mental "pictures" of all these elements of our microcosm & cosmos, so that they can become *real* to us! In short, *IPP gives us back our sanity!*"

I'm glad the boring speaker said this, because this is exactly what I would have said, if I had his courage!

Sincerely yours,

Dick