Engineering our Future, Re-defining University Education

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The majority of the technologies that we as human beings currently benefit from are based on risks, research, and hard work done over the last hundred years or more. We have enjoyed great success at optimizing technologies to improve transportation speed, communications ability, machine computational performance, nano-sized manufacturing ability, etc. These new capabilities have led to great new scientific observations. The biggest obstacle to scientific advancement is not technological, it is that new discoveries don't always agree with the contemporary scientific paradigm of "Accepted Knowledge". This either results in outright suppression and ridicule by the scientific community[1], or requires existing theories to be refined with ad hoc addendums, tweaks, special case exceptions, and liberal rationalizations. Lacking is the encouragement of new theories to be formulated and tested with the same zeal that orthodox theories are defended. To enable the next generation of profound scientific advances, we need to conquer social as well as technological boundaries. We need to take a risk with our generation, and that risk is to accept what we "know" may be incorrect.

The current scientific "establishment" is more akin to a belief system than the Socratic Method. The current attitude that humanity's existing scientific knowledge is infallible is no more valid now than when it was "known" the Earth was flat. New theories and ideas need to be objectively examined rather than ridiculed. Otherwise today's scientists and engineers become defenders of accepted knowledge rather than active participants in discovering the secrets of our universe.

> "The ultimate ignorance is the rejection of something you know nothing about and refuse to investigate."
> --Dr. Wayne Dyer

The Electric Universe group states the current environment well: "It is easy to confuse theoretical assumption with fact. And today the tendency also conceals a tacit belief that, despite the mistakes of previous generations, we have the big picture right and the remaining task is simply to tidy things up a bit….The actual situation in the sciences calls for openness to new possibilities." [2]

The Electric Universe group has experience firsthand that when challenges are presented to existing theories, they are defended and dismissed often times due to scientists' inability to process information that conflicts with [1]pre-existing beliefs. [2]

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[1] This concept is also known as Groupthink, the phenomena of individuals in social groups to suppress dissenting opinions in order to promote group harmony. [see Wikipedia])

[2] Thornhill, Wallace; Talbott, David; Thunderbolts of the Gods; 2005; Page 11

Gerald Pollack, a professor at the University of Washington has also experienced difficulty when challenging established theories: "Challenging convention is not a bed of roses, I assure you. You might think that members of the scientific establishment would warmly embrace fresh approaches that throw new light on old thinking, but mostly, they do not. Fresh approaches challenge the prevailing wisdom. Scientists carrying the flag are apt to react defensively, for any such challenges threatens their standing…Those few challenges that do gain a following are often dealt with aggressively: the establishment dismisses the challenger with scorn and disdain often charging the poor soul with multiple counts of lunacy… The consequence is predictable: science maintains the status quo. Not much happens. The edifices of science continue to grow on weathered and sometimes even crumbling foundations, leading to cumbersome models and even fatter text books filled with myriad, sometimes inconsequential details. Some fields have grown so complex as to become practically incomprehensible." [3]

The sentiments expressed above illustrate the need to alter how we receive observations that are not in agreement with current scientific theories. Anomalous observations are the most valuable of all to a true scientist, as they can lead to the next breakthroughs in understanding. Experiment always trumps theory. I propose the creation of a university that embraces ideas and information that challenge conventional science, keeps an open mind to new possibilities, and reviews established theories with the same critical eye given to new ones; in short, teaching objective observational science instead of the "established accepted doctrine". Perhaps "teaching" isn't even the appropriate word for the new university, more fitting might be "showing", as nature speaks for itself.

New Type of University

What would this new university look like? It would take on a more classical approach to learning. Scientists were once called Natural Philosophers as they looked to understand how nature worked along with an element of philosophizing. The scientific method has brought rigor to evaluating philosophies (hypotheses) but has it diminished the wonder and openness of investigation by requiring a hypothesis. It is faulty to examine new phenomena with a pre-existing idea as to its behavior or function, it presumes knowing something about which you know nothing about. A hypothesis is actually a built in bias and prevents impartiality of observation. The null hypothesis is one attempt to go into research without bias. It allows for experiments to be guided by curiosity alone. However, curiosity alone may not be enough to stimulate impartial investigation of new, controversial phenomena.

Current University Research

Most current university research can be divided into two categories: applied research and basic/pure research. In most cases, applied research is guided/funded by industry and corporate interests. This is because companies fund research projects that may solve challenges they expect to face for a particular product. The motivation behind the investigational research is commercial, not purely scientific. With an already determined application in mind, research may not be "pure" in the sense that there is a pre-determination of the desired results of the study. Certainly impartiality is not existent in such a setting, even if performed by an independent party, the university. Companies may fund basic/pure research if somehow there is a product application in the future.

Most basic/pure research is aimed at furthering existing theories. To some extent, there are attempts to use new technology to accomplish the previously deemed impossible, but this is limited in scope to what is perceived as "now possible with the aid of new technology". This doesn't lead to any revolutionary new understandings of nature's inner workings. What university begins with the premise- "Let's do an experiment that shatters everything we currently know!" ?

Underground Scientists

There is a scientific underground of curious investigators that tinker in their garages, basements, or even kitchens. Their homes are a substitute for labs, classrooms, and manufacturing facilities. The aim is to learn about how nature works, investigate phenomena readily dismissed by mainstream science, or revisit old research; all based on empirical work (experiments). The advantage these "underground scientists" have over their industry counterparts is their minds are untainted by pre-conditioned beliefs about how things "should" work. Impartiality and open mindedness is a pre-requisite to true science.

This community is filled with people of various backgrounds, capabilities, resources, and understandings. Often there is collaboration and guidance from others with some experiential insight, but for the most part they are simply tinkering. Occasionally, there will be unexpected results or phenomena that are not understood. This often leads to wild claims, an undisciplined approach to recreate the results, and poor write-ups that don't allow for peer duplication. There are some tinkerers that have more discipline and have made working proof of concept devices. In almost all cases the discoverer gets selfish and wants to "get rich" with a product, and ceases to share important construction details; or there is some underhanded conspiracy involved with the working devices and the technology is never released.

I am very familiar with this sub-community as I have been following this movement very closely since 2006. I recreated devices, I went to alternative energy/science conferences, and I studied all the books I could find. From 2008 to 2010, I worked as a technology evaluator for a group looking for exotic energy devices. We received numerous submissions. Each time, the inventor was certain that they had something very valuable. They performed their initial evaluation and were convinced it was something revolutionary. All too often they did a very poor job evaluating the technology and their claims were unsubstantiated. With proper work and evaluation techniques, their ideas may have turned into something. In addition, there was an even larger number of inventors who were unable to build their idea/invention themselves, but who were convinced it would be successful when built- essentially armchair theorizing.

New University Vision

The premise of this institution is this: teaching is done by nature, by experimental reality, not by conjectural theories.

The vision of this university is not only to break out of the mold of conventional "accepted knowledge", but to improve upon and completely redesign the university model of education. This entails more than just the subjects being taught, but extends to all aspects of the university experience, as will be listed below.

Instruction Approach

Different people have different learning styles, and some people do not process information best from the paradigm of the professor lecturing for an hour on a given topic. Certainly instruction will be part of

the experience, but there must be other stimulus as well: as much visual material as possible should be incorporated into instruction sessions, to offer the visual learner easier accessible information. In addition to experimental demonstrations, hands on models should be provided whenever possible to cater to the physical learner. In short, instruction should stimulate as many of the human senses as possible; this will ensure the maximal retention of material. Gone are the days of just showing up to a lecture and taking notes.

Classroom sessions should promote lots of questions in the course of instruction, the professors should not only ask lots of questions of the students, the students should be encouraged to ask questions about any curiosity that enters their mind, or if something is too abstract for them to comprehend, or if there is a concept they have trouble grasping. Good thought provoking or critical thinking questions asked by students should be given praise by the instructor. Critical thinking skills and independent thought should be valued over just the recitation of a lecture. The traditional "lecture" would be replaced by a more interactive classroom experience - participation is mandatory. Accordingly classroom sizes would have to be kept small – 15 people or less, to ensure maximum participation and to prevent students from being intimidated by asking questions.

In the same spirit, classes should not be held to rigid one hour time frames. The daily schedule of classes would be flexible enough to include large time intervals in between classes so that a given instruction session could extend longer if the students are having trouble grasping a topic. The goal would be to make measurable progress every day, with all students progressing at the same rate.

The absolute best way to really learn something is by teaching it. Accordingly, some of the lower division classes would be taught by upper classmen. This would ensure the upper classmen have a comprehensive understanding of the subject. The students would be coached by professors in how to put together and deliver an excellent lecture, and the professors would be present in class to address any questions or help moderate discussion. Basically the upperclassmen would do the teaching and the professor would be there to help guide them. The whole objective of the exercise would be to facilitate a positive, participatory learning environment. The upper classmen would be encouraged to forge relationships with the lower division students outside of the classroom, provide tutoring, advice, and generally ensure the success of newer students.

Re-prioritizing Objectives

One of the primary questions that must be asked when forming a university is – What attributes do we intend to impress upon our graduates? These attributes could include educational concepts, character traits, interpersonal skills, cognitive abilities, and life skills. Historically, universities have focused only on providing an academic education to its graduates. In this new university, it should be considered to not just provide an education of how to succeed in the workplace, but an education of how to *succeed in life*. From this new perspective, the university would embody a holistic approach to higher learning, an approach that teaches its students skills for being an intrepid scientist AND skills that promote a successful and happy life filled with healthy relationships.

Some of these life skills might include:

- Techniques for dealing with difficult individuals

- How to deal with adversity and criticism from others
- How to resolve difficulties encountered at work/school/in relationships
- The importance of having integrity and considering how one's actions affect others and the positive impact this plays in not only one's own life, but in society as a whole. "Be the change you want to see in the world" – Mahatmas Gandhi
- Consideration of one's life purpose and how to pursue it
- How to use intuition to aid in making decisions
- How to self judge and judgment of others
- Techniques that promote self confidence and high self worth
- Cognitive techniques for positively dealing with rejection and setbacks

Additional Skills that would aid in workplace are:

- How to deal with "closed minded" scientists/skeptics/people
- Interpersonal skills and how to effectively function and communicate in groups and meetings
- How to foster positive workplace dynamics
- How to promote creativity and individuality in other people
- How to help "teach" these skills to co-workers
- Being cognizant of "groupthink" and how to avoid it

Additionally, there are some "educational principles" that would be impressed upon students:

- Question everything, don't accept something as fact without validation
- Always view theories as conjecture, suppositions, and models, not fact
- Observation of nature is how to acquire true knowledge
- Creativity, individuality, and critical thought is encouraged, rather than conformance
- Have confidence to ask questions when you don't know something
- Your education is never complete, there is always something new to learn

My Vision for a new university would be a combination of the current university instruction approach in concert with empirical learning. There would be core academic topics that each student would have to master. Students would be presented with modified teaching materials that promoted openness and acceptance of controversial results. The curriculum would present multiple theories that explain the same phenomena/observations, and the advantages/disadvantages would be discussed for each theory.

Each theory would be accompanied by their supporting data and assertions. The student would not be required to accept mainstream accepted theories as immutable doctrine, and in fact would be encouraged to “find his own truth”.

After students learned the core material, they would be required to create demonstrations to validate their knowledge. The need for tangible experiences to provide feedstock for their creativity database is a key tenet. The next requirement is that all students must possess a certain baseline of hands-on technical skills. In order to promote building prototypes and new experimental setups, the students must be instructed in machining and fabrication skills. There would have to be an on-site machine shop, and workspaces allotted to students for assembly of their projects.

Because the university is being founded to teach ideas counter to mainstream science, the first course that students will take is a history of science as a discipline. This will include historical re-examination of past scientific organizations that opposed new scientific discoveries [Earth is round]. In addition, it will be examined what social conditions caused this opposition by the establishment, the detriments and impedance this had to advancement of knowledge, and potential solutions for mitigating future “suppression” - by defenders of accepted knowledge. Explored will be the insecurities that cause otherwise intellectual people to subvert the science discipline, and some possible remedies to this opposition. The existing social limitations are as big an impediment to new advances in the sciences as are the current technological limitations.

After the students have completed training in the core material and gained the required hands-on competencies, now is where the university starts to create its own body of work. This will occur twofold:

1. Experimentation and Testing: The students will now choose a core scientific principle to demonstrate, and improve upon any currently available demonstration. This can be a complete redesign, a modernization of archaic demonstrations, or improved measurement techniques. The experiments must include baseline testing data from the demonstration apparatus, detailed procedure to allow for replication, materials used and measurement methods, summary of findings, and a list of next steps and possible improvements. These “knowledge exhibitions” are to be performed in front of the rest of the students, sharing the experience with the student body and also giving the presenter valuable presentation skills. Different theories can be explored to explain the experimental observations taken.

2. Vetting of Outside Technology Submissions: The goal would be to create a pipeline with a large number of inventors submitting devices that they are unable to build, but have solid theoretical basis for its operation, and need a prototype built to test the design. Essentially this university would become the foremost authority on exotic devices. There would be formal reports documenting the device, how it is made, proposed claims, a disciplined testing procedure, testing results and data evaluation, and finally conclusions about the functioning of the device.

Core Research and Experiments

Observational Curriculum

- Electricity
- Di-electricity
- Magnetism
- Light
- Space
- Mass/Matter
- Temperature
- Time
- Aether

The science based curriculum would be the most difficult to put together. The main difficulty is this: there is no repository (that I know of) right now that is aware of all, or even a majority, of non-conventional phenomena that would be suitable for instruction at the university. It would probably take a search of internet forums, consulting leaders in non-conventional or free-energy science, visiting all sorts of people across the country/world to even begin to establish a significant index of the potential things to teach. Then there is the complication of being able to master and recreate the anomalous phenomena consistently. It would be wise to visit each discoverer and learn the nuances of the effects. There may be some things that require the building of specialized apparatus. Basically we would be creating the definitive storehouse of non-conventional physics

Life Skills

- *Cross disciplinary approaches to problems*
- *Effective skills for working in groups*
- *Accurate measurement techniques*
- *Common Principals of nature*
- *Problem mapping and solution skills*

This area probably wouldn't be as difficult, as I'm sure plenty of material could be found that details the techniques for these skills, but experts would have to be hired. I feel like it would take more than psychologists/sociologists to create the curriculum however; concepts such as learning intuition, finding one's life purpose, and contemplating the impacts of one's actions on the world seem to have a somewhat new age/spiritual connotation, and would likely require very specific people to teach.

Of all the obstacles, putting together the curriculum is the most difficult, but it is certainly do-able. It would be an education not available anywhere else in the world that's for sure! And it would be something that contributes to the betterment of the world with every graduate. I see it as an excellent area worthy of investing effort into, but the compilation of the curriculum is a major challenge.

Teaching Process

My vision of the university would consist of teaching in a three phase approach:

1. Presentation of teaching materials
2. Demonstration workshops

3. Experimentation and Testing Laboratories
4. Brainstorming new ideas that improve the current experimental setup, followed by constructive group discussion and evaluation of ideas.

Student Motivations

The current educational paradigm uses the issuance of grades to assess student abilities as well as to motivate student performance. This practice has been accepted without question, but needs review. The use of grades to judge academic achievement has a serious flaw: it places the focus on getting a good grade rather than a good education. For this reason grades will not be used. The shocking realization will manifest: "I actually have to learn this stuff!" The student has to realize his education is *his* responsibility, which is more than just a grade, and he will be at a disadvantage if he doesn't properly learn the curriculum. [See: *Zen and the Art of Motorcycle Maintenance*]. Certainly there will be tests and incorrect answers will be marked, but no grades will be issued. If the student isn't motivated to acquire his own education what is he doing at a university? Certainly if a student is falling behind there will be an intervention by both students and professors to see what the best solution is. Learning will be more teamwork oriented rather than individually oriented.

Background Knowledge

Because of the numerous new skills and concepts to be taught at this university, it would be a heavy burden on the university to also provide a conventional college education as background material. This would have to be done before being able to cover recent advances and ideas. For instance it would not make sense to teach Circuit Analysis or Physics 101 at this new university, that education can be acquired at a variety of other institutions. Therefore it would be advantageous to require a certain level of existing education before enrolling as a student of this new university. Accordingly, the new university can place its focus on delivering its specialized topics. This pre-existing education need not necessarily come from a higher learning institution, it could also be self taught, work experience, or otherwise, so long as the student already has some foundational basics with which to contrast new topics against.

Presentation of Teaching Materials

The different subject materials presented would each focus on a specific core research topic. As the university progressed sub-core research topics would be presented as well.

The presentation of the subject would highlight natural phenomenon and provide pertinent real-world examples to give a reference framework. Then observations would be presented that have already been made by scientists during research into this topic. This step is the differentiator from other teaching practices; this is the presentation of different theories to explain the same observations. Each theory will have the following:

- List of each theory's supporting observations/information
- List of observations/information that does not fit theory or needs to be explained or further examined
- Limitations of the theory
- What the theory interprets correctly and what it fails to interpret correctly

This is meant to present the student an option of which theory makes the most sense to them. If the student does not agree with any of the theories presented, this would represent a deficiency in the current understanding of a core topic and an area for investigation.

The current orthodox theories would be included, as well as their predecessors, and contested alternatives. The purpose is to promote critical thinking and problem solving, not rote memorization and conformance to conventional ideas.

The textbook will also include a flowchart and timeline of how we arrived at the current orthodox theories. The flowchart will highlight significant experiments, their observations and the conclusions that were drawn. It will also inform the student how those conclusions were addressed by other theories. Dissenting opinions of the theory must be presented as well.

It is important for the student to understand the societal factors that influenced science as well. This will involve providing adequate back story as to why there was acceptance of theories that were still contested and did not adequately explain observations.

Demonstration Workshops

To gain deeper understanding it is very important to have firsthand experience of phenomena as much as possible, particularly with phenomena that is counter to conventional science. Demonstrations will accompany each core research topic. The demonstrations will display behaviors that are to be observed and contemplated. No theories or hypotheses are made initially by the student; instead the focus is on witnessing the phenomena, taking careful measurements, and recording the data. Since demonstrations are simply well practiced experiments, it is important that each student is able to recreate the demonstration for his/her himself. This will develop their technical abilities of fabricating tangible equipment. It will also develop their attention to detail and troubleshooting skills when recreating a demonstration. The practice of forcing students to produce real experimental devices mirrors what happens in industry: building something that works! A completely new depth of comprehension is acquired when students construct a functioning piece of demonstration equipment. Understanding the underlying mechanics of how something works is the first step to improving upon it.

Experimentation and Testing Laboratories

This also serves as a form of continuous improvement because there may be enhanced demonstrations that the students can develop. Also this is the opportunity to begin making hypotheses about the phenomenon they have observed in the demonstration. Is there a way to measure the effect? Are there better experiments that could lead to better understanding of the observations?

Experimenting and Testing is one of the most important aspects of this new university. In the late 1800's and early 1900's nothing was "figured out" and there were new findings, new observations, new experiments being presented very frequently. This gave rise to very intelligent people designing experiments to create, leverage, and enhance observed phenomenon. Since there was no "standard body of knowledge" yet, there was openness to scientific discovery. Creativity, attention to detail, intuition, and insight into nature's fundamental principles were key assets to scientific advancement.

Books to read and be part of the curriculum

The Fourth Phase of Water – Gerald Pollack

Thunderbolts of the Gods – David Talbott and Wallace Thornhill

The Electric Universe – David Talbott and Wallace Thornhill

The compiling and coalescing of material to create the curriculum will be a large undertaking