

# Affiliation of Christian Engineers and Scientists in Technology (CEST) Newsletter

Summer 2015 Issue 35

American Scientific Affiliation/Canadian Scientific & Christian Affiliation

## IN THIS ISSUE

	page
From the Editor	1
One last challenge: a planetary physics problem	1
Answer to Challenge: When is Cheryl's birthday?	1
The Ten Commandments for Engineering an article by Dennis Feucht	2
CEST Contacts	5

## From the Editor

In last Fall's newsletter I wrote these comments:

"What is to be the future of CEST? By the end of this year I will have turned 75 and will have completed 50 years in the ASA. I do not plan to prepare CEST newsletters beyond the time of the ASA 2015 annual meeting at Oral Roberts University. ..."

If you are interested in the future of CEST perhaps you would like to volunteer or nominate someone else to serve as president, vice-president, secretary-treasurer, or newsletter editor. Please send me your comments, or better yet, bring them to our meeting in Tulsa.

I hope to have a CEST business meeting at the ASA annual meeting in Tulsa, probably immediately following the Saturday afternoon sessions in one of the session meeting rooms. Watch for an announcement at the meeting

My thanks to those who contributed to this issue, i. e., Dennis Feucht, Dave Kramer, and Heinrich Erbes and George Kent.

And a special thanks to Dennis, who has contributed an article to each of the large majority of newsletters over the past nine years. Thank you Dennis!

BY ■

## One last challenge: a planetary physics problem

Perhaps a new newsletter editor will pose some problems for you to solve, but for now this is my last.

Imagine a planetary system with only one planet, the Earth, revolving around the Sun in a circular orbit 93 million miles in radius. The Sun has a mass that is 333,000 times that of the Earth.

Since the mass of the Sun is finite, its position is affected by the pull of gravity from the Earth, and we can assume that the center of the Sun moves in a circular motion around the center of the two-body system.

Question: What is the phase of the sun in its "orbit" relative to that of the Earth, and what is the radius of that "orbit"?

Please send me your result with your reasoning. I will let you know what other responders have said and perhaps together we can agree on the solution. If there is a new newsletter editor after Tulsa, he/she may choose to acknowledge responses in a future newsletter. [BY](#)

## Answer to Challenge: When is Cheryl's birthday?

Dave Kramer (Chelmsford, MA) submitted this challenge problem which he found in the New York Times Science section, and which we posed in the Spring issue.

The problem:

*Albert and Bernard just met Cheryl.  
"When's your birthday?" Albert asked Cheryl.*

*Cheryl thought a second and said, "I'm not going to tell you, but I'll give you some clues." She wrote down a list of 10 dates:*

*May 15, May 16, May 19*

*June 17, June 18*

*July 14, July 16*

*August 14, August 15, August 17*

*"My birthday is one of these," she said.*

*Then Cheryl whispered in Albert's ear the month — and only the month — of*

*her birthday. To Bernard, she whispered the day, and only the day.*

*"Can you figure it out now?" she asked Albert.*

*Albert: I don't know when your birthday is, but I know Bernard doesn't know, either.*

*Bernard: I didn't know originally, but now I do.*

*Albert: Well, now I know, too!*

*When is Cheryl's birthday?*

I received correct answers from Heinrich Erbes, Hedgesville, West Virginia, and from George Kent, Needham, MA. I also received this from a frustrated member: "With the numbers given, I could see how Bernard would know, but Albert would still have to guess."

Here is my solution:

1. After reading the problem you should infer that Bernard knows that Albert knows the month and Albert knows that Bernard knows the day.
2. Now, what do we learn when Albert who knows the month, says, "I don't know when your birthday is, but I know Bernard doesn't know, either."? Well, if the day had been 18 or 19, Bernard would have known because those days are included only once each. 18 would have meant June 18 and 19 would have meant May 19. So Albert has just revealed that the month is not May or June.
3. What do we learn when Bernard says, "I didn't know originally, but now I do"? We know only the days 15, 16, or 17 would give him the date because 14 does not give a unique month. So the date is July 16 or August 15 or 17.
4. Since Albert now says he knows the date, the month must be July and the date is July 16. If the month had been August, the date would have still been ambiguous to Albert.

BY ■

**The Ten Commandments  
for Engineering  
an article by Dennis Feucht**

The Ten Commandments are a familiar, though fading, cultural feature of Euroamerican society, and in a larger sense, of human culture generally. What they have to do with engineering is the topic of this article. Expect some surprises - and maybe some conceptual revelations.

As the record indicates, the Big 10 were historically received by Moses on stone tablets when he was on Mt. Sinai, somewhere east of Egypt, during the formation of ancient Israel as a nation. The Ten were essentially the executive summary of the set of obligations (or national law) of Israel under their covenant, the constitution of the new nation. Unlike modern *democracy*, where the highest authority is "We the people", the covenant with their sovereign, YHWH (as transliterated from paleo-Hebrew to Roman letters), made their government a *monarchy*. Because the king was considered quite meta-human - a god - this also made it a *theocracy*, administered in part by a *hierarchy* ("rule of the holy") of priests.

The commandments are largely stated in the negative, which means they set limits on correct human behavior rather than prescribe what must be done. Consequently, anything within these bounds was acceptable behavior for Israelites. Because they establish limits, they function as a set of *specifications* for humans and can be regarded similarly in their application for engineering. Counterintuitively, all ten apply in engineering. So let's go through the list.

**First Commandment: No Other Gods**

The First Commandment seems entirely irrelevant to engineering, yet it forms the bedrock for the success of the engineering enterprise. For Israel, because their king was YHWH, any disloyalty to him would be an act of treason. All nation-states have anti-treason laws for obvious reasons of governmental stability. Society nowadays, including engineers, is sharply divided on the question of whether there even are any higher powers like YHWH to be governing, or at least having anything to do with the world of humanity. We need not haggle here over that question because in a practical sense, one's *god* is whoever's laws one obeys,

laws you respect to the point of being willing to follow.

This is true of engineers. All engineers have a childlike faith in the laws that prescribe how the physical universe functions, as described in the scientific and technical literature. We recognize that though sci-tech knowledge is tentative in the sense that it continues to be enlarged and refined, we have utter faith in this process and in the tentative results of it thus far. Ancient Israel recognized the same laws as manifestations of the character of YHWH, though they did not understand them in the more rigorous way we do today. We find the laws of nature to be so reliable, so beyond reasonable doubt, that no engineer climbs out of bed in the morning wondering whether Ohm's Law will hold that day or not. We know it will and do not give it a second thought. Most engineers have not even given it a first thought. We are "true believers" in these laws.

This might seem like an overstatement of an obvious point but that is only because our adherence to the implicate order of the universe as expressed by its laws has been so successful over the last few centuries that nobody steeped in a science-technology view of the world seriously considers any other option. We have lived sheltered lives. Yet conflicting views exist and are increasing today in social influence. Like engineers, the true believers of ancient Israel rejected (for a while, for some of them) the gods of paganism because they did not have the same characteristics as YHWH. While the Hebrew literature emphasizes the covenant-faithfulness of their sovereign as seen in how he upheld both Israel and nature, the gods of paganism were, in contrast, fickle, undependable, unreliable, and unpredictable in their behavior. It was not possible to know how they would behave, and with that outlook, the scientific enterprise was futile. The best that could be done was to appease the gods, hoping they got up on the right side of the bed that morning.

The pagan worldview sees the physical world this way, and all of us might remember in our experience as engineers those exasperating problems with circuits that *seemed* to have no rational explanation. These situations for engineers can lead us to wonder whether

the pagan gods have returned and are tampering with our circuits. Yet as true engineers, we persist and eventually resolve these vexing engineering problems with solutions that were logical and consistent with the laws of both the physical world and of engineering design.

Today, the influence of scientific and engineering thinking is waning in the developed world, as neo-paganism in the form of the New Age worldview makes inroads into the cultural mind-set. If this is foreign to your thinking (which is not bad!), find some New Age literature in a bookstore and start reading. It will infuriate or disgust you. Sci-tech language, which has a specific and rational meaning in a sci-tech context, is used merely to exploit from it the power of science and technology, all the while rejecting its content that gives it that power. Therefore, for engineering, we will follow no other such gods.

**Second Commandment: No Idols**

What could engineering possibly have to do with the rejection of idols, you might wonder. Idols are the product of a culture that has fallen into what philosophers call the error of *reductionism*, a kind of oversimplification whereby a thing and its representation fail to be differentiated. Originally, idols were representations of the gods, but in time, the respect that the gods were given transferred over to their mere representations, and the focus was on the idols instead. All that the gods were had failed to be differentiated from idols of them.

Nothing like this goes on in engineering, though - or does it? Of course it does. Some engineers are so enamored with circuit simulation and its power that they tend to forget that simulation of circuit behavior is not itself the actual behavior. The scope of such engineering idolatry extends beyond simulation to include any theoretical notions one is enamored of that take on a life of their own, apart from the inflexible and demanding laws manifested by circuits on the bench. And there are even idols on the bench: instruments that offer some representation of circuit behavior which might fall short of the characteristics of that behavior itself. Engineering is crawling with idols, but the virtuous engineer heeds this commandment by continually being self-reminded to check assumptions and not

fall into the trap of oversimplification and reduction of a robust reality to a lesser shadow of the real thing.

### **Third Commandment: No Mischaracterization of God**

The Third Commandment is a prohibition on taking the name of the God of Israel “in vain”. It is commonly believed that this means to avoid uttering curses such as “God damn it!” but that would be a reductionistic view of it. In ancient and medieval times, the word *name* had a more robust meaning than now. By it, we usually refer to the label we attach to a thing or idea in order to identify it; for us, a name is merely a symbol. To those in the past, it primarily referred to the essential characteristics of the thing named, of what made it what it is in contrast to all else. Thus, the “name of ... God” is the distinctive character of God. Taking a name in vain mischaracterizes what is named.

For engineering, mischaracterizing the foundational truths underlying the enterprise is how this commandment can be violated. It is not only the New Age movement that might be accused of this, but it appears in engineering whenever the bedrock theory supporting the enterprise is distorted or mischaracterized in some way. The result can be especially hard on those learning the concepts.

Examples are found in naming conventions. In the early days of discovery of a new phenomenon, causes are attributed to observed behavior that later, under refinement of the theory, are found to have been incorrect. Yet in time, language solidifies and what becomes known as obvious errors continue as part of the language. For instance, voltage is not force yet it is still called by physicists “electromotive force”, or “back-emf” in the motor literature. Magnetic field intensity or field strength is called “magnetizing force” despite its inconvertibility from A/m to newtons.

Another more penetrating form of Third Commandment violation is what R. D. Middlebrook of CalTech called “high-entropy equations”. This is math put in a form that obscures rather than reveals its relationship with circuits. The circuit property that the math entails is hidden in its formulation and can easily misguide (if not discourage) those trying to relate the equation to that which the equation represents and is supposed to describe.

Then there are articles, papers, and books with errors that should have been caught by the author that mischaracterize in some way electronics principles. Having written a few electronics books, papers, and articles, I confess that I am guilty on all counts. My *Analog Circuit Design* book-set is in its second edition and I have found tens of errors in it, despite the removal of a few more egregious errors from the first edition. I certainly had no intention of introducing those errors, but at the time I was oblivious to them - unintentional disobedience to the engineering form of the Third Commandment.

### **Fourth Commandment: No Work on Sabbath**

The Fourth Commandment allotted the last day of the week as a day of rest and as a social indicator or sign that the covenant with YHWH was in effect. It was at least intended to be a labor law. No electronics company that I know of works its employees seven days a week, though some situations call for it such as the overhaul of natural-gas-powered steam turbine generator systems twice a year by utilities. (Later in history, the Christian leader, Jesus, did not have any quibbles with these kinds of exceptions; the rest day was for the benefit of humanity, not the other way around.)

There are companies that run three shifts a day, seven days a week. In electronics, it is usually due to the nature of the processes and the infeasibility of shutdown of them once a week. However, the Fourth is still observed for individual workers to whom it applies.

Another benefit of a day off (no less two per week in the developed world) is to have time to “catch up”, to reflect on the wider scope of one’s weekly activities, and to have time to think through a few of the many interconnections between the many concepts in our minds that have yet to be connected, thereby simplifying and clarifying our understanding. It is a time when one can relax and experience the creativity that results from some recreation.

### **Fifth Commandment: Honor Parents**

This commandment to “Honor your father and mother ...” is actually more down-to-earth than just that. It means taking care of your parents in their older years. Modern governments and corporations have nearly obsoleted this

commandment (or so it seems) by taking over the obligation through social security and pensions. It is somewhat strange, upon reflection, that one should rely on the kindness of strangers over family members for life’s essentials - yet this is one of the many institutional inversions in modern society.

For engineering, the application of this commandment to senior engineers is increasingly falling by the wayside as some companies let experienced engineers go in the wan hope that younger, lower-cost, and less-experienced engineers will step into their shoes. It is sometimes unappreciated by non-technical managers (such as the proverbial “bean counter” business-driven ones) that a first-rate engineering team is not a commodity, and that it is difficult to find and effectively engage the best engineers. Many of them are among the best because they have been improving for decades and are actually more capable in their 50s and 60s than they were in their 20s and 30s. While one’s “energy bandwidth” eventually rolls off, the age at which rolloff is appreciable is too often underestimated and people who are the bulwark of technological progress in the company are sent to early-retirement Nirvana; they are not honored.

Some companies discover (or knew all along) that these “older workers” can outperform younger ones on finer details of engineering, and they hire them back on a contract basis. This commandment thus ends on a positive note as this trend appears to be increasing.

### **Sixth Commandment: No Murder**

This one is not as irrelevant to electronics as it might at first seem, though few electronics engineers are convicted murderers - at least not in any direct sense. Our form of murder is more subtle. The biggest killing operations in scale are militaries fighting wars. Some consider that war, although undesirable, is sometimes necessary, and they have little reticence to work on electronics in weapons systems. Other engineers, who believe there are no *just* wars, there are just *wars*, would consider themselves by participation responsible for what the military as an institution exists to do: kill people and destroy things. The nature of mass human conflict today is changing somewhat, and technology is lessening the evils of older-style warfare with, for example, non-lethal weapons. Despite

this, already in this new millennium, millions of people have been killed in the many wars that presently continue.

Another way we can be responsible for murder is to overlook safety considerations in the design of products that can be life-threatening if they malfunction. The list is long and includes automotive, aerospace, medical, and cyberspace electronics. Registration of engineers as "Professional" is intended to be an institutional solution to engineering negligence or incompetency, yet like so many institutionalized solutions, it can work against its own purpose when engineers and non-engineers rely solely upon licensing for safety.

#### **Seventh Commandment: No Adultery**

This commandment has got to be irrelevant to engineering, it might at first seem. It is commonly believed that it forbids sex outside marriage, though what it actually forbids is making another man's wife pregnant (or activities that could lead to this outcome), thus *adulterating* the genetic family line.

How could this possibly apply to electronics? It is not only genealogies that can be adulterated; so can electronics parts themselves. Ideally, reputable manufacturers source good parts to distributors, and these parts make their way through the distribution chain, like generations on a genealogy tree. In recent years, illicit parts have found their way into the distribution chain that do not have the better characteristics of the parts from the established sources. This has resulted in reliability and performance problems in the field when these parts are not discovered and culled from distribution. "Marriage licenses" in the form of source certification documents are now in use by distributors, guaranteeing the source of their parts for discriminating buyers who do not believe in free and uninhibited distribution.

#### **Eighth Commandment: No Stealing**

Some engineers steal parts from company inventory, but on the whole, few engineers appear to be kleptomaniacs. What constitutes stealing depends on how you define *property*. If you believe that there is such a thing as "intellectual property", then you might also believe that it is possible to steal ideas from others. If you instead believe that IP is an oxymoron, like round squares, then you are thinking along the historic lines of

what legally is considered property: if you have it, I don't, and vice-versa. In this notion of property, ideas can be copied and propagated, and even originated, but if you have an idea, I can have it too and we both have it. It is not property. Despite this, it takes some time, effort, and resources to invent, to do R&D, and there ought to be some advantage to the person who develops an idea with monetary benefit to it. I leave it to you, my reader, to decide what constitutes property and stealing in our information age. The idea of stealing certainly has not gone away in electronics.

Another form of stealing is to incorrectly attribute or neglect to attribute the source of ideas or works to the originators. This is a discourtesy, yet it is a minor form of stealing some of the glory that should have gone to another. It is sometimes hard to avoid, and is best avoided by keeping it in mind. Whenever we fail to give due regard to the contributions of others, we are stealing from them some of that intangible that is "glory" or honor or respect or due regard. The Eight Commandment was directed to material things, though it is not necessarily limited to tangibles.

#### **Ninth Commandment: No False Testifying**

This commandment prohibits what in a court of law is called perjury - lying while "under oath". In essence, it is not about lying in general but about lying to the detriment of others. (One can argue, for instance, about whether those who lied to NAZIs about where Jews were hidden were breaking this commandment. Or whether a psychologist who lies to a patient, thus leading him out of his psychosis, is breaking it.) This commandment applies primarily to trials, to "not bear false witness against the innocent". It is about false incrimination, about framing people, about false-flag operations, and about fraud.

In electronics, not all products are accurately specified and can lead the unwary buyer to trust a product for an important function in which it subsequently fails, to the detriment of the buyer. If the published specs were intentionally made better than the product to sell more product, then the exaggerated testimony in the seller's specs and advertising regarding the product's abilities have benefited the seller at the expense of the buyer - a kind of dual

violation of this and the previous commandment.

Many manufacturers only reveal some facts about what they are selling. They expect the buyer to buy the product without being told in sufficient detail what they are buying. This is not a false testimony but by withholding certain information, the buyer can be led into a purchase that otherwise would not be made. The open-source movement recognizes that full disclosure is the best policy, and they are gaining in influence and acceptance.

#### **Tenth Commandment: No Greed**

Last but not least is the commandment against a state of mind: wanting what others have because they have it. Distinctions between jealousy (I want what you have) and envy (I want what you have and I don't want you to have it) can be made, but at the root of the problem that this commandment addresses is, as 19th-century American writer Samuel Johnson put it, "greed beyond the bounds of common avarice." Like kleptomania, it is an obsession for acquisition mixed with social status. It is what drives anyone who wants it all for himself: the monopolist, the Scrooge, the power elite, and the company that shoots itself in the foot by minimally compensating those who contribute significantly toward its success.

The technical "brains" behind Tek at its founding was Howard Vollum, a humble, unpretentious, and generous man who encouraged innovation. He and co-founder Jack Murdock introduced *profit-sharing*, an innovative idea not found in Detroit. (H-P also had it.) Howard was willing to share of the company profits with all the employees and not just the stockholders. Labor unions could never get into Tek because the workers knew they would lose benefits under a union. Howard kept the Tenth. Extreme counterexamples in other industries could be named. Happily, the electronics industry has not had the kinds of conflicts driven by violation of this commandment that other industries have in their history. Hopefully, it will stay that way, though the electronics industry is consolidating and has become the largest industry in America.

It is interesting that of all the improprieties of the human mind, this one should be included in the Big 10. Perhaps it is the worst kind of mental aberration to

have, though this is not emphasized nowadays. Other moral issues are put in the spotlight. It was in 2008 when record-breaking violations of the Tenth by Wall Street banking, investment, insurance, and rating houses came to light. The economic damage done by the large financial centers, motivated to break the Tenth, in the last decade has eclipsed the scale of individual violations of the other commandments. (See the award-winning documentary movie *Inside Job* for a clear presentation of the enormity of Wall St. Tenth-breaking.)

For those of you who are Ayn Rand enthusiasts, you would know that she promoted “greed”. Her use of the word, however, is somewhat different in meaning. My understanding of what she really meant by it was that you have to look out for yourself and that what you work for you justly own. She did not seem to add “at the unfair expense of others”. The meaning of the word as used here is more in the mainstream of its English use and should not, directly at least, conflict with Rand’s use of the word *greed*.

#### Closure

Human nature is a two-edged sword. Some of the greatest achievements (some in electronics) and some of the worst depredations have come from it. We are given free will and a set of ten operating specs. The challenge is in how well we can meet spec. Within them is enormous freedom; not one of the ten is a tax statute! The electronics industry and engineers in general have kept them better than the general population, and our industry has thrived since its inception. The challenge we face is in how to keep the Ten under the varying parameters that time brings to history and technological change.

Do you have any opinion on any or all in the list as applied to engineering?

#### **ASA/CEST Newsletter Distribution**

*The primary distribution of this newsletter is via email to ASA/CEST members as indicated in the ASA’s online directory. Members are expected to keep their email address up to date there. No paper copies are mailed. Recent past issues are located at <http://www.asa3.org/ASA/cest> . All issues are archived at the YahooGroup [asa\\_cest@yahooogroups.com](mailto:asa_cest@yahooogroups.com) web site, where they are accessible to group members. To join the group, go to [groups.yahoo.com/group/asa\\_cest/join](http://groups.yahoo.com/group/asa_cest/join) and follow the instructions.*

*Bill Yoder, ed. ■*

#### **CEST CONTACTS**

Newsletter correspondence: Send to Bill Yoder, CEST president, at [LWYoder@ieee.org](mailto:LWYoder@ieee.org)

CEST secretary: Jack Swearengen at [jcsweat@sbcglobal.net](mailto:jcsweat@sbcglobal.net)

CEST founding president, Ruth Douglas Miller at RDMiller at [rdmiller@ksu.edu](mailto:rdmiller@ksu.edu)

American Scientific Affiliation  
55 Market St., Suite 202 – PO Box 668  
Ipswich, MA 01938

Opinions expressed in news items quoted and articles are those of the sources or authors, not the ASA or CEST.