Christian Engineers and Scientists in Technology Newsletter

From the Editor

This newsletter is intended to facilitate camaraderie and exchange of information among CEST members. Reader responses and other inputs are welcomed. Please send me **your** input for this newsletter.

My thanks to those who contributed to this issue, i. e., David Elliman, Dennis Feucht, Michael Huster, Harold Reed, and Bob Thoelen.   BY ∎

Math Challenge Answered
Readers determine sum of infinite series

The challenge given in the Summer 2012 newsletter was to find the sum

$$\sum_{n=1}^{\infty} \left(\frac{1}{4}\right)^n = ?$$

Two readers submitted solutions and they are both presented below along with my solution.

First received was this solution by **Michael Huster**, *Professor of Physics, Nyack College:*

Start with the well-known identity
$$1 - x^{N+1} = (1 - x)(1 + x + x^2 + \cdots + x^N)$$

This can be easily proven by multiplying out the RHS, or, if you like, by induction. So

$$\sum_{n=0}^{N} x^n = \frac{1 - x^{N+1}}{1 - x}$$

Subtracting 1 from both sides of the equation and simplifying the right-hand side yields

$$\sum_{n=1}^{N} x^n = \frac{x - x^{N+1}}{1 - x}$$

If x < 1, then when the limit $N \to \infty$ is taken this series converges. The result is

$$\sum_{n=1}^{\infty} x^n = \frac{x}{1 - x}$$

Now substitute x = 1/4, and the final result is

$$\sum_{n=1}^{\infty} \left(\frac{1}{4}\right)^n = \frac{1}{3}$$

Bill Yoder Solution:

Then I wrote out my solution, which I had in my head when I submitted the challenge:

Write our several partial sums:
$(1/4)^1 = ¼$

$(1/4)^1 + (1/4)^2 = 5/16$

$(1/4)^1 + (1/4)^2 + (1/4)^3 = 21/64$

Apparently the general term is
$$\frac{1/3(4^n - 1)}{4^n}$$

As n approaches ∞, the term $1/4^n$ vanishes, so the result is 1/3.

To prove by induction that the term above is the general term we must show that it works for n=1 and that if it works for n it also works for n+1. For n=1 we get

$$\frac{1/3(4^1 - 1)}{4^1} = \frac{1/3(4 - 1)}{4} = 1/4$$

Now if it works for n we should be able to add $1/4^{n+1}$ and see that it reduces to the expression for the general term with n replaced by n+1. We have

$$\frac{1/3(4^n - 1)}{4^n} + \frac{1}{4^{n+1}}$$

$$= \frac{1/3(4^n - 1)}{4^n} + \frac{\frac{1}{3} \times \frac{3}{4}}{4^n}$$

$$= \frac{1/3(4^n - 1 + \frac{3}{4})}{4^n}$$

$$= \frac{1/3(4^n - \frac{1}{4})}{4^n}$$

$$= \frac{1/3(4^{n+1} - 1)}{4^{n+1}}$$

Q.E.D.

Finally, I received this solution from **Harold Reed** — *which I think is the slickest of all!*

"I think I have the solution to the summation problem. If I can figure this out, a lot of other people probably can too."

$$\sum (1/4)^n \text{ from } n = 1 \text{ to } \infty$$
$$= ¼ + ¼^2 + ¼^3 + ¼^4 + \ldots$$
$$= X$$

Multiply by 4 and you get:
$$1 + ¼ + ¼^2 + ¼^3 + \ldots = 4X$$
$$= 1 + X$$
$$3X = 1$$
$$X = 1/3$$

                                                        BY ∎

New Challenge!
Probability Puzzle
Readers Please Respond!

The **Monty Hall problem** is a probability puzzle loosely based on the American television game show *Let's Make a Deal* and named after the show's original host, Monty Hall.

Suppose you're on a game show, and you're given the choice of three doors: Behind one door is a car; behind the others, goats. You pick a door, say No. 1, and the host, who knows what's behind the doors, opens another door, say No. 3, which has a goat. He then says to you, "Do you want to pick door No. 2?"

Question: Is it to your advantage to switch your choice? Provide your rationale for your answer. Send your response to lwyoder@ieee.org. I will acknowledge correct answers next time.

The puzzle statement above comes from Wikipedia, but please don't go there for an answer. Figure it out yourself!   BY ■

**Most Important Technologies
Please submit your candidate(s)**

This item requests **your response – your candidates for the most important technologies**. See Below.

The IEEE has a group called the Society on Social Implications of Technology. Its role is to look at how various technologies impact society – not so much in their intended ways, but in unintended and sometimes negative ways. The SSIT publishes a magazine carrying articles on such subjects – the IEEE Technology and Society Magazine.

Recently I've seen some articles about a different kind of relationship between technologies and society. This is illustrated by the title *Our Tools Are Using Us*. [IEEE Spectrum, August 2012] Here is a quote from the article:

"… our brains seem to crave the virtual world, with repeated exposure producing changes that resemble drug addiction. According to Gary Small, a professor of psychiatry at University of California, Los Angeles, the excitement of getting an e-mail alert causes a release of dopamine, a neurotransmitter that reinforces the behavior and thus drives us to crave more such stimulation. Before long, it becomes impossible for people to put down their iPhones and BlackBerries. Dopamine's effects were shaped by natural selection: It helped to focus our attention so that we wouldn't be eaten by tigers. These days, it is facilitating our consumption by e-mail and text messages.

"Many experts believe our internet addiction is similar to that associated with gambling. In both cases, people find it difficult to function normally, have stable family lives, or be effective at work.

"It will be years before we fully understand the lasting effects of living in virtual worlds. But until we do, it is best to approach the situation with caution. The main challenge we face is to recognize that we are designed to reside in a slower-paced physical world. This is extremely difficult to accept. We want our news instantaneously. We want to be in

touch with everyone at all times. Our careers depend on our being constantly available.

"But we have to make a choice. We can design our lives so that we stay in control, or we can cede the control of our lives to our tools."

Clearly, a technology can take a too dominant place in our lives. However, some technologies have become almost essential to us, and our lives would be much diminished without them.

Now here is the question for you. **What do you believe are the most important technologies ever developed?** By most important I mean technologies that have had the most beneficial impact on human society. Send me your candidates and I will compile a list from all responses for the Winter newsletter.

For this purpose we will use the following broad definitions of technology:

the practical application of knowledge [merriam-webster.com]

the application of scientific knowledge for practical purposes [oxforddictionaries.com]

Send your response to lwyoder@ieee.org. I already have my candidates for the top three, but I won't say what they are until next time.   BY ■

**Devotions for Engineers:
Rest in the Lord
By Bob Thoelen**

I met Bob Thoelen at a recent meeting of the Boston chapter of the ASA. He told me some about his work, about his family, that he had been to Bible college for a while, and that he likes to write. So a few days later I asked him if he'd like to write something for the newsletter, and he seemed eager to do so. Here is his piece. Maybe he will write more in the future.
                              BY

Rest in the Lord

As I am now in my 12th year of working in the engineering field, I am reflecting back on how senior engineers helped me in getting acclimated to the company culture and methods. Over the last year, I realized that I'm now in the position of seeing people younger than me get hired, and helping them get used to the company. I worked very hard as a new engineer, putting in a great deal of effort, but at the same time developing an equal amount of stress.   I was the guy coming

in to work with the large coffee, and having three or four more cups before the day was over. I have found myself recently giving advice to younger people to take it easy on caffeine, and take a break once in a while. Because of continuous improvement programs, the struggles to get to market first, and the economy, people are working harder than ever. Many employers offer flexible schedules, while at the same time giving employees remote access to work, so many people get the feeling of never quite leaving the office.

One of the ways that I've found to apply my Christian faith to my work is to develop a sense of inner peace that Jesus spoke of. In John 14, Jesus mentions the wonderful promise of Heaven to those who trust in Him. He also promised to send His Spirit to come alongside us and guide us in verse 18: "I will not leave you as orphans; I will come to you." (NASB) When His work on earth was done, the Holy Spirit came to guide us into the spiritual truth that God would have us to know. We are not left wandering aimlessly about how to follow and serve Jesus.

In John 14:27, Jesus tells us "Peace I leave with you; My peace I give to you; not as the world gives do I give to you. Do not let your heart be troubled, nor let it be fearful." (NASB) I've found that reminding myself of this during the difficult days of work, has been a comfort to me. The context here was that Jesus would soon ascend to Heaven, and the disciples would be left to do ministry work. Jesus promised peace that would come from knowing the Holy Spirit would not leave them alone, and would guide them.

In the times when we may have great concern, such as an upcoming major deadline to a project, or what our performance review may look like, we can rest in knowing that no matter what happens, we have a peace which comes from knowing Christ. Let's strive to let Him work within us, transforming our concerns and fears about our work and the future to knowing the peace of God which "passes all understanding." (Phil. 4:7) After we know this peace, we can then be bearers of it and examples   to our colleagues. To those who are seasoned engineers, let's work to share this peace with others on the job who struggle with stress. Maybe sharing could be as simple

as an encouraging word to the person whose recommendation for a course of action on a project was vetoed by senior management. Or it could be in the form of a longer-term mentoring relationship. Younger engineers, I would encourage you to meditate and think about the peace that God gives to us. For it to take hold in our lives, we must believe what God says in His Word, and learn to practice spiritual disciplines which develop this peace in us. I've personally found that silently praying the Lord's Prayer at regular intervals during my day helps to keep my mind from getting too worried about the cares of the work day. A strong sense of knowing the Holy Spirit's presence and work in our life, will give us an inner strength to face our engineering challenges.

Robert E. Thoelen III, October 2012 ∎

Can God Heal a Car?
MIRACLES AND METAL
By David Elliman

This article, originally written in 1985, along with the appended theological reflections that were written later, currently appears on the website of Christians in Engineering in a booklet called *With Christ in Engineering*. CiE is a British group that parallels CEST. We'd be interested in your reactions to this article. Please send them to lwyoder@ieee.org.   BY

MIRACLES AND METAL

By David Elliman, Emeritus Professor, Faculty of Science, University of Nottingham

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Many of us in the West are used to thinking of God, contrary to our Bibles, as Lord of the spiritual world but only distantly Lord of the material. We have included this fascinating article to show that there really is no split between our spiritual and physical lives.   *CiE*

ABSTRACT: This article describes a remarkable experience in which the power of prayer seemed to overcome the natural laws governing the failure of a universal (or Hooke) joint.

The ubiquitous universal joint was invented by Robert Hooke, who was President of the Royal Society in the Seventeenth Century, and is now an indispensable link in the transmission of power for almost every wheeled vehicle.

The natural law that states, 'any component containing moving parts in contact will be subject to wear, and eventual failure', applies inexorably to the
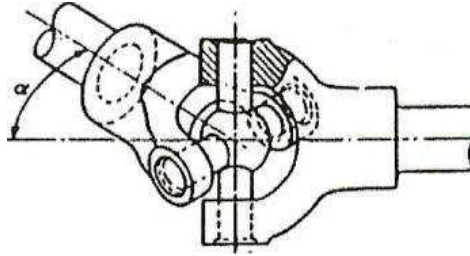
A typical universal or Hooke joint

U / J. The rate of wear can be minimal if the unit is regularly given a squirt of fresh, clean grease. Joints manufactured since circa 1970, however, fail comparatively quickly as no grease nipple is fitted in deference to the insane god of built-in obsolescence.

The mechanism of failure is as follows:

Grease is gradually lost from the joint, this process accelerating as the seals wear. Water and solid particles then ingress, causing corrosion and wear. At a certain level of wear, the joint will emit a characteristic 'clank' if the throttle is suddenly closed when driving at a steady speed. This may induce severe anxiety in some drivers, but joints will usually 'clank' happily for several thousand miles without catastrophic failure. Inside a joint in this state, the needle rollers are developing ever – widening flats, and ceasing to roll. The working surfaces of the bearing are suffering a combination of wear, corrosion, and impact damage from the 'clanks'.

Very rapid deterioration begins once the wear reaches the stage at which some of the rollers disintegrate, or manage to fall out of the joint. The joint now runs wildly out of true, the 'clonk' becomes a 'thump-screech' of tortured metal, and a heavy low frequency vibration will be experienced by all in the vehicle. Only a madman would wish to drive further and witness the final death agonies of the U/J, which are likely to be destructive to adjacent parts of the vehicle!

Such was the state of the U/J on the nearside drive-shaft of my Hillman Imp as I picked up my passenger, Ginnie, and her four children from Northampton, with the intention of taking them home to Wimbome in Dorset.

I described the lamentable state of the car, and suggested that Ginnie and children took the opportunity of savouring the

attractions of Northampton, whilst that I visited the nearest Rootes dealer. It was fortunate that I had a full set of tools with me. The proposition was flatly unacceptable to Ginnie, who explained she knew the Lord wished her to lead a meeting in Wimbome in four hours' time, and it was imperative that she was on time.

I tried to explain slowly and patiently why this was now impossible, if my car was to be the means of transport. 'Rubbish', exclaimed Ginnie, 'The Lord can hold this car together – why don't we pray about it?'

I was boggled at this response! There was no way that I had the faith to believe that God would hold together a mechanical component that I could see and feel to be disintegrating.

We prayed – or rather Ginnie and the children did. I was not sure whether to laugh or cry. 'Let's get moving, then', said Ginnie, without the slightest doubt that the car was now serviceable. I started the engine, and began to move off with an 'I told you so' expression all over my face.

To my amazement there was no sound from the joint, not even the 'clank' that I had tolerated for far too long. I drove at a steady twenty for some miles, but everything was so smooth that I soon gained the confidence to drive at normal speed, and at over 70 mph on the Motorway. The car ran perfectly all the way to Ginnie's front door, where we arrived in good time for her meeting. After a cup of tea, I set off to drive the couple of miles home. The 'thump-screech' was back with a vengeance! I limped home at a crawl with the noise becoming more and more dramatic. Once in our drive, I got under the car and as I touched the U / J it fell apart in my hand.

For some time I puzzled over these events, and kept the remains of the U / J in a box, to be venerated as holy relics. I came up with several dumb theories to explain the apparent miracle. The best of these was that the drive-shaft had a perfectly straight run with the extra weight aboard. On inspection it was obvious that the reverse was in fact the case, and I was forced to accept that something supernatural had happened – a miracle that Ginnie could receive in faith, but which was an area of unbelief for me.

I don't have any difficulty in praying for people, but cars, washing machines, televisions ... these mechanistic devices seem to be beyond the reach of prayer. Or is my God too small? DE

This article first appeared in the Engineers Group Newsletter Summer 1985.

We asked David Elliman for some theological reflections on the article he wrote in 1985. As he shows, his sense of awe at what happened has not diminished with the years. CiE

Looking back with hindsight, this remarkable event seems even more astonishing than it did at the time. I am tempted to believe that there was an element of exaggeration or dramatisation in my account. Yet to the best of my memory the events are true and accurate, tending if anything to understate the difference that followed Ginnie's prayer. I believe that I was and still am sane, and that a miracle did occur.

As a scientist and engineer, I do not expect miracles to happen. I believe in a universe that follows physical laws which are not set to one side because one lady is late for a meeting. To believe that God would intervene miraculously for such a small matter, is to face many uncomfortable questions. Why does he not intervene to send rain to Southern Africa where thousands face starvation? Why did he not heal a young man who died of cancer recently, leaving a young wife and three small children? Is there any point in carrying out careful scientific experiments when a capricious God might change the rules at any time, and make nonsense of the results?

As a Christian, however, I am forced to be open to the possibility of God intervening in his creation in ways that we perceive as miraculous. The Bible is peppered with miracles. Some are huge and magnificent like parting the Red Sea or the raising of Lazarus. Others seem more like conjuring tricks, as when Peter walks on the water or when Moses' staff turns into a snake. When I became a Christian in my second year as an undergraduate, I assumed that miracles of this kind had ceased. I had a feeling that God might help people recover from illness in subtle and unseen ways, and would remember the sick when I prayed. I had no strong theological position on the subject, but was in no doubt that water into wine was a thing of the past!

My own experience and the accounts of other Christians led me to read the Scripture carefully on this point. I was surprised to find an overwhelming case in Scripture for the continuance of miraculous events.

I have found this request for reflection on the incident most disturbing. I find that I believe in the theoretical possibility of miraculous events, but find them unacceptable and unreasonable on an intellectual level. At the root of my problem is the extent to which the physical and spiritual realms interact here and now. As a scientist I believe that they do not interact at all. As a Christian I believe in practice that they interact to the extent of the Holy Spirit drawing people to the Father, and in my spiritual growth. When I reflect on this incident I start to think that the reality might be more like a Frank Peretti book, with the sky thick with Demons and Angels swooping down to defend the faithful with fiery swords outstretched.

I seem to be able to hold these views nearly simultaneously, or at least to switch rapidly between them, like a time-sharing operating system between users. This is dishonest, and disorientating. The request to put my reflections on paper has brought this issue to a head. It is time to decide whether it is valid for God to do trivial miracles, just because a woman and children ask with faith, or whether this is an affront to his dignity, my theology and everybody's common sense.

As I write the question, I know the answer I am forced to give. The kingdom of God is indeed among us, and where Jesus rules, unexpected, even untheological, things seem to happen. What clinches it for me is the second miracle, which occurred about a year after this one. My father was diagnosed as having chronic lymphatic leukaemia, with the disease in a fairly advanced state at diagnosis. This disease causes the body's tissues to become choked with abnormal white blood cells, and causes the spleen to expand greatly. It is easy to monitor the progress of the condition by the monotonic increase in the count of white cells per ml of blood. My father was expected to live about two years from this diagnosis, with perhaps one per cent of cases surviving five years. At first the disease progressed as expected. However, one Friday evening Dad attended a Full Gospel Businessmen's meeting in

Ipswich. He asked for prayer at the end of the meeting, and after a few minutes of prayer slumped to the ground where he remained apparently unconscious for over forty minutes. My mother was frantic, and kept asking why an ambulance was not summoned!

Following that meeting Dad had no further symptoms of the disease, and his doctor expressed amazement as his white blood cell count decreased month by month. Apparently remission was not uncommon for short periods with this illness, but with a stable rather than falling count. Over two years his blood count returned to the normal level. Dad lived for a further 15 years without any recurrence of this illness. I would welcome comments from the medical profession, but believe from reading in the University Medical Library that a permanent remission of this kind is extremely rare. The fact that it followed immediately from prayer is sufficient evidence to convince me that miracles do occur as a normal part of the Christian life.

My father died of an unrelated cancer in 1989. During this illness which lasted for about a year, many people prayed for his healing. I was enraged by people from his fellowship who would come to pray for him and pronounce him healed – in the absence of any evidence. He took this with tremendous grace and courage, while I looked for a cricket bat with which to smash their skulls. The truth is that such gracious miracles of healing are rare. We do great harm if we are insensitive to those who are ill and in pain, and pray for a miracle without wisdom and love.

In conclusion, I do believe that we live in part in the kingdom of God, which follows different laws from the physical universe. We may expect to see signs of the kingdom from time to time. However, we cannot demand or expect miracles to our order and convenience. Our lot is to share the sufferings of a fallen world, to die, and to face judgment. It is our privilege to love the Lord, and share a little of his compassion for people while we remain. Sometimes he will invite us to pray quietly for the miracle he plans to do, but always he commands us to show his love and care to the world he redeemed.

DE ∎

Analogies Between Scripture and Engineering: The Metaphysics of Modeling

An article by Dennis Feucht

This article presents some analogies between engineering and science, and theology and philosophy. They are illustrative of the wholism of our world in that truth has the same basic characteristics in all fields of study. More specifically, what God has revealed of himself in the creation is consistent with what he has revealed in the Word or Logos of God as given in scripture and in the incarnation of the Son.

One of the comparisons that is made in the study of ancient cultures, including study of their languages, is the difference between Greek and Hebrew metaphysics. The Greeks were primarily concerned with what a thing is in itself: its *ontology*, or what it is made of. The Hebrews were more concerned with what something is in terms of its interaction with other things, or what it is *relationally*. Biblically, we are defined in terms of our relationship to our Creator. It is this relationship which gives meaning to life (as *Ecclesiastes* concludes). The simplified - and sometimes oversimplified - distinction is that Greek thought is analytical while Hebrew thought is wholistic and relational.

Greek versus Hebrew Views of Humanity

The New Testament shows some Greek influence, having been written in Greek using Hellenistic expressions. Nevertheless, it is thoroughly Hebrew in worldview. The "Greek worldview" consists of several schools of thought appearing in Greek history having the common thread of paganism, reaching back to its source in the babylonian mystery religion. The early church confronted a system of thought - primarily in Alexandria, Egypt and Rome - that is generally referred to as *gnosticism*. It was largely influenced by Plato and, in first-century church history its main proponent in Europe was the Samaritan syncretist, Simon Magus.

The outlook of the New Testament authors, however, is characteristically Hebrew. (See George Eldon Ladd, "The Greek Versus the Hebrew View of Man" in: *The Pattern of New Testament Truth*, pp. 13-40, Eerdmans, Grand Rapids, MI, 1968.) Although the Apostle Paul uses Greek imagery in addressing his multinational audience, Paul's theological concepts are rooted in the Old Testament.

> In order to understand Paul, therefore, one must not call in the assistance of the gnostic systems, the mystery religions or the Hermetic writings, but rather seek in the knowledge of God in the Old Testament the source from which Paul has drawn even for the formulation of his proclamation. [Herman Ridderbos, *Paul: An Outline of His Theology*, Eerdmans, p. 36]

Gnosticism, though inactive for centuries as a movement, lives on to a remarkable degree today under the New Age label. Gnosticism has a dualism of worlds, the visible, physical world and the invisible, "spiritual" world. We stand between these two worlds, with our truest self, our soul, being a part of the invisible world, but fallen into the visible world of matter, imprisoned in a physical body. Gnostic salvation is the freeing of the soul from matter for its return to the invisible, heavenly realm. Matter is considered the source of evil, and redemption is accomplished by a heavenly redeemer who descends to earth to lead the fallen souls back to heaven. Just as gnosticism has a dualism of worlds, it also has a corresponding dualism of body and soul.

In the Greek pagan tradition one might say: man *has* a body; man *has* a soul. In contrast to this anthropological dualism is Hebrew wholism. To the Hebrews, it would be more correct to say: Man *is* a body; man *is* a soul. Instead of being an escape from the evil physical world to invisible realms, biblical salvation is a *restoration* of humanity to true earthly creaturehood in fellowship with God. God created the physical world and "saw that it was good". Instead of saving the soul from the body, God saves the whole person, as soul and body. The emphasis in the NT is on *bodily* resurrection.

Furthermore, this salvation is accomplished by a redeemer with a physical body, which to gnosticism would have been unacceptable because matter is the source of evil. In contrast, evil to the Hebrews was due to a broken relationship to the Creator and could only be corrected by a member of the human race, the Son of Man. What much of the apostle John writes is aimed at defense of early church teachings against early gnostic tendencies. (See F. F. Bruce, *The Defense of the Gospel in the New Testament*, pp. 74-87, Eerdmans, 1959.) John insists that Jesus Christ has come "in the flesh", not "by water only, but by water and blood", and that "many deceivers, who do not acknowledge Jesus Christ as coming in the flesh, have gone out into the world." (1 John 4:1; 2 John 7; 1 John 5:6; John 1:14; John 19:34, 35)

Before relating this to engineering, it might be worthwhile to also demonstrate that this contra-gnostic view runs throughout the Bible, including the Old Testament. Unlike the Greek view of humans - a union of two parts, body and soul - the Hebrew view is as flesh animated by God's breath (*ruach*) and thus as a living soul (*nephesh*) (Gen. 2:7; 7:22). As George Eldon Ladd writes:

> *Nephesh* (soul) is not a part of man; it is man himself viewed as a living creature. *Nephesh* is life, both of men (Ex. 21:23; Ps. 33:19) and of animals (Prov. 12:10). If *nephesh* is man as a living creature, it can be used for man himself and indicate man as a person (See Gen. 14:21; Ex. 16:16; Num. 5:6; Ezek. 33:6 (RSV, "any one"); Deut. 24:7 (RSV, "one"); Gen. 46:18 (sixteen "persons"). See Rev. 18:13 for this use.) and also become a synonym for "I," "myself." (Ps. 34:2; Gen 27:35, lit., "that my soul may bless you"; Jer. 3:11, "herself" equals "her soul.") By an easy extension, *nephesh* is man seen in terms of his appetites and desires (Eccl. 6:2, 7) or in terms of his emotions or thoughts (Hos. 4:8; Ps. 35:25; Gen 34:8; Ps. 139:14; Prv. 19:2).

For the Greeks, because the soul had an existence apart from the body, and because it came from the heavenly world and originated from the divine nature, the soul was itself immortal. The medieval church was also influenced by this doctrine because of a preoccupation among prominent schoolmen and theologians with Greek writings. The Hebrew hope of a blessed existence after death, however, was based on a confidence in God's power over death and not on a view of something immortal in humans. The OT does not see *souls* in sheol (the place of the dead) but *shades* (*rephaim*) or "ghosts", a sort of pale replica of humans as living creatures. (See Job 26:5; Ps. 88:10; Prov. 9:18; Isa. 14:9; 26:19.)

In the NT, when Paul talks about the sanctification of body, soul, and spirit in 1 Thessalonians 5:23, he is not saying that man is composed of three essential substances any more than Moses and Jesus are affirming four substances when they command us to love God with all our heart, soul, mind, and strength. Biblical language, especially Hebrew, is often repetitive. This repetition does not indicate a precise distinction of ideas. What one Bible writer calls *soul*, another may call *spirit*, *mind*, or *heart*. Another may even use the word *soul* to mean physical appetite. In four instances in the Old Testament it even refers to a dead body. The dualistic viewpoint thus leads to impossible contradictions if applied to scripture. (See Robert D. Brinsmead, "Man As Body and Soul", *Verdict*, AUG 1978, p. 13, 19.)

Hebrew wholism has profound theological implications. The Greek idea of the immortality of the soul is common within the prevailing medieval doctrine of salvation. The main issue of the Reformation was over whether we are saved by the grace infused into us - by our sanctified life - or by the grace given us in the work of Christ. According to the medieval view, our salvation rests on a quality within us. The Reformers, however, taught that salvation was grounded not in any quality within us that God finds acceptable but rather in a quality found in our representative, Christ. Through a certain kind of *relationship* to Christ, they taught, are we saved. The teaching of Rome was an ontological salvation while the Reformers taught a relational salvation. The notion that something within us is saved by God stands in contrast to the Reformation teaching of our complete dependence on our relationship to Christ, by faith, in whom alone is eternal life.

Because another variant of the Greek view, neoplatonism, had a philosophical influence during the Middle Ages, it is not surprising that some prominent theologians identified the Christian doctrine of eternal life with Platonic immortality. To paraphrase T. A. Kantonen, in *Life after Death*, (Philadelphia Fortress Press, 1962, pp. 14-15), through the centuries this belief continued to permeate thinking and to weld itself with popular animism into such an apparently self-evident and formidable "truth" that it seemed to be a veritable cornerstone of the Christian faith. In the Fifth Lateran Council (1512-17) the Roman church indeed proclaimed it to be an official dogma of the church.

The Reformers were content with the ancient creeds which teach the resurrection of the body, not the immortality of the soul. Yet so firmly has the pagan belief become imbedded in the Protestant mind too that the theologian or the minister who is led by scripture to reject it is regarded as iconoclastic. Humanity does not have a mortal part, the body, and an immortal part, the soul. We are an indivisible unit, a body-animated-by-soul. As such, whether viewed under the body-aspect or the soul-aspect, we exist solely by our relationship to God.

The Apostle Paul, who is the most easily misread of the NT writers (other than John's *Revelation*, of course, for which it is harder to tell for sure), is sometimes interpreted as dualistic in his view of humanity. Historian F. F. Bruce writes this about Paul:

> Paul evidently could not contemplate immortality apart from resurrection; for him a body of some kind was essential to personality. Our traditional thinking about the 'never-dying soul', which owes so much to our Graeco-Roman heritage, makes it difficult for us to appreciate Paul's point of view. It is, no doubt, an over-simplification to say that while for the Greeks man was an embodied soul, for the Hebrews he was an animated body; yet there is sufficient substance in the statement for us to say that in this as in other respects Paul was 'a Hebrew born and bred' (Phil. 3.5). For others, including several of his Corinthian converts, disengagement from the shackle of the body was a consummation devoutly to be wished; but if Paul longed to be delivered from the mortality of this present earthly 'dwelling', it was with a view to exchanging it for one that was immortal; to be without a body of any kind would be a form of spiritual nakedness or isolation from which his mind shrank. [F. F. Bruce, "Paul on Immortality", *Scottish Journal of Theology 24*, 1971, pp. 457-72]

Finally, consider Jesus' statement, which on the surface seems to show Greek dualism. In Matthew 10:28 he says:

> Do not be afraid of those who kill the body but cannot kill the soul. Rather, be afraid of the one who can destroy both soul and body in hell.

This text states, first, that to God the soul is destructible; it can be destroyed. Second, the sense of the overall text is that one should not fear those humans who can destroy us in our mortal state in this life; rather, one should fear him who can take away or sustain life in an absolute sense. Death came into the world by God's judgment upon the human race in Adam. This is not a death of part of a person, but death of the whole person just as life from God is life for the whole person. This means that when we die, our death is total. There is no divine spark of a soul which lingers on in a disembodied state. There are no ghosts as such (not even the one the witch of En-dor (1 Samuel 28:7) presented to Saul by magic). In death, our existence in the age to come is wholly dependent upon God's ability and will to give us a new bodily existence. But this life in the new age is not the embodiment of an inherently death-proof soul. Life is derivative for us. It is found inherently only in Christ. In death we are totally dependent upon his life for our resurrection. Life and immortality are his gift (2 Tim. 1:10; 1 Cor. 15:21-22). Our resurrection to God's judgment of life cannot be separated from Christ's atonement for us.

If we are to restore an appreciation of the New Testament proclamation of Christ's resurrection, we must first restore the deadness of death. We must appreciate its radical seriousness as the last stage of man's disease, as the ultimate uncleanness and opposition to God. This is what Christ conquered and bridged for us so that neither sin nor death can separate his people from fellowship with God (Rom. 8:32-39). In Christ, his people have perfect righteousness and therefore perfect fellowship with God - a fellowship which not even death can affect in the slightest degree because Christ dies no more. Even though those in Christ die and await resurrection on the day of the Lord, in Christ they have already crossed over and been resurrected. Though dead in themselves, they are made alive in Christ and in him continue in perfect fellowship with God.

The resurrection of Christ teaches that the restoration of the whole man in bodily existence is the destiny of the Lord's people. It was not a disembodied Christ who appeared and brought joy to the disciples. The hope of the church is the resurrection and the putting on of a somatic (bodily) immortality at the *parousia* (1 Cor. 15). "The blessed hope" is his coming, not our going. The differences between Hebrew to Greek worldviews might be summarized:

➤ Body and soul are different *parts* of a person in the Greek view while they are different *aspects* of the whole person in the Hebrew view. To the Greek, we are incarnated souls; to the Hebrew, animated bodies.

➤ To the Greek, the soul is innately immortal; to the Hebrew, life comes from God who alone gives bodily "eternal life" as the life of the age to come.

Engineering Model Analogies

The difference of ontological and relational views of humanity has its correspondence in the basic kinds of models that appear in engineering. This is illustrated concretely by the example of the transistor. In the early days of transistor development (and in particular, *bipolar junction transistors*, not *field-effect transistors* as are typically found in microprocessors) the strange, new device was not well understood. In science and engineering, when a somewhat mysterious entity of interest appears, it is often first modeled using a *black-box model*. The "black box" is the opaque object under scrutiny and is called this because what is inside the box is largely unknown.

How can an unknown entity be characterized? Poke it and see how it responds. More precisely, a black-box model is a *relational* kind of model based on characterization of behavior. In electronics, behavior is typically that of voltage and current *waveforms*, where a *waveform* is an electrical (or physical) quantity as a function of time. The model is relational because it is developed based on how the "box" relates to external interaction with it. For the transistor in particular, the following diagram (with the "black box" as the block) is the basic model.

I will try not to burden non-electronics engineers too heavily in making the
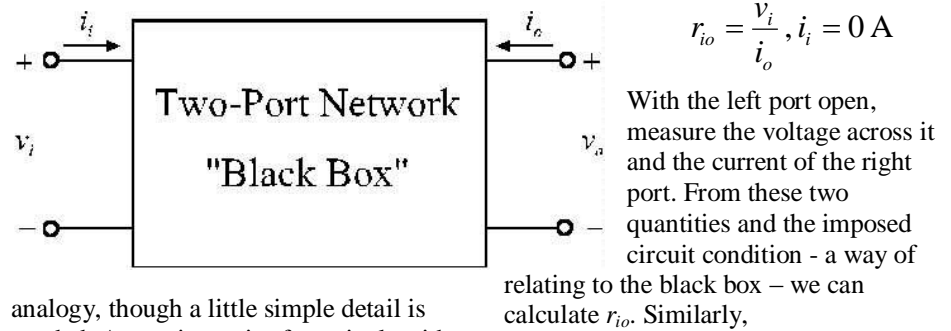
analogy, though a little simple detail is needed. A *port* is a pair of terminals with the polarities of voltage and current associated with them defined, as shown. Transistors have three terminals and one of them must be shared by both ports as a common bottom (–) terminal. This results in three possible configurations with three different common transistor terminals. The voltage across the left port is v_i and the right port is v_o. The current going into the + terminal of the left port, i_i, also comes out the – terminal of the left port (and similarly for i_o and the right port). We need one more electrical relationship, the most basic one to the electronics engineer, Ohm's law: $v = i \cdot R$, where R is resistance. Then without knowing what is in the black box (and assuming that it will behave *linearly*), we can nevertheless produce a formalized description of its behavior in terms of the port electrical quantities, with resistance, r, as a parameter:

$$v_i = r_{ii} \cdot i_i + r_{io} \cdot i_o$$

$$v_o = r_{oi} \cdot i_i + r_{oo} \cdot i_o$$

This black-box model has four resistances that define the given transistor. The resistances, r_{ii} and r_{oo} are affected only by the quantities associated with their respective ports and not by the other port. They can thus be expressed as $r_{ii} = r_i$ and $r_{oo} = r_o$. In contrast, r_{io} and r_{oi} depend on both ports for their definition and are interport or "transport" parameters.

We can find the values of these parameters without opening the box in the following way. To find r_i, open the right port so that $i_o = 0$ A in the first equation. Then solve for r_i; $r_i = v_i/i_i$. Similarly, $r_o = v_o/i_o$, $i_i = 0$ A. For each port, measure the port voltage and current (with controlled external excitation) and substitute into the equation for that port. For the other two parameters, r_{io} is found by setting i_i to zero. This is implemented by opening the circuit connection into the left port. Then

$$r_{io} = \frac{v_i}{i_o}, i_i = 0 \text{ A}$$

With the left port open, measure the voltage across it and the current of the right port. From these two quantities and the imposed circuit condition - a way of relating to the black box – we can calculate r_{io}. Similarly,

$$r_{oi} = \frac{v_o}{i_i}, i_o = 0 \text{ A}$$

The last two parameters, in electronics language, are *transresistances*.

The transistor was so-named as short for "transfer resistor". Thus a simple transistor model could be devised that is dependent upon the circuit configuration – that is, which of its three terminals is the common bottom terminal of both ports. The four resistances thus characterize the relationship of the ports in respect to their voltages and currents.

What does this model tell us? It tells us nothing about the structure (or ontology) of the device in the box. It only tells us how it responds under certain externally applied conditions. The model is based on what the transistor is in relation to port parameters found from behaviors observable outside the box. The resulting model of two equations describes electrical behavior that can be deduced from the interactions needed to find the parameters. It assumes that the device is linear and that the equations are valid. These assumptions are made tentatively, not knowing what surprises the actual device in the box might manifest beyond the known behavior.

In contrast to the relational model is the *physical* or structural model. In this model, the box is opened and the device inside investigated. By knowing the structure, and knowing how the components of the structure behave, it is possible to deduce from the laws governing those components how the box will behave. What is different from the relational model is that all possible behaviors that can be deduced from the circuit laws are included in the model. This is a decided advantage over the black-box model. For the transistor, the structural model is based on solid-state physics and resulted in model development in the 1960s and '70s of the Ebers-Moll and Gummel-Poon models.

The model details need not concern us except to note that they are themselves equivalent circuits with circuit components (or elements) that are already well understood, such as resistances, capacitances and dependent (interport) current sources. These structural models capture a very wide range of transistor behavior and (almost) nothing of interest to the circuit designer is missing from the refined models.

In view of the additional power or insight that the physical or structural model gives, it is not unexpected that ancient Israelites would want to subject God to such scrutiny – to want to know what makes him "tick". Israel kept asking Yahweh for his name; in other words, they wanted an ontological, inside-the-box model of God. By understanding his essential characteristics, they might be able to use him for their purposes just as engineers use transistors for their purposes. God's reply was the enigmatic tautology: I will be who I will be. In other words, it is not to be of our concern. The question is probably even ill-posed. Instead, God has offered to us only a relational model. It is weaker in power for us and does not disclose the ontology of God to us. Our means of relating to God is proscribed by God. It is as though God has given us the two equations of the transistor black-box model and, with its parameters, we can understand something about God. Yet this understanding is in the context of and limited by the behaviors used to obtain the parameters. In other words, our interactions with God are constrained to occur within the context of a range of behaviors by which we know God. Outside of the given model, we can only speculate. This limitation is most frustrating to those who want total intellectual control of their world, and many are consequently atheists. This motivation, at its root, does nothing to deny the existence of God; it only denies the acceptability of God's prescription of what we can know of him.

For the pagan Greeks, the desire to understand the inner structure of human existence ontologically also led them into faulty views of how we can relate to God. On the other hand, their search for ontological understanding of man was, in part, the science of psychology (or sociology), and even today, psychological models of us attempt to get "under the hood" and explicate the nature of the mind in models. We ourselves, as part of the creation of God, are subject to our own scrutiny, though our understanding of ourselves is subject to not only Gödelian limitations of logic but also to the limitations that our faulty nature places on understanding of ourselves. It is a bootstrapping problem for psychology, summed up by the apostle Paul in eschatological language (1 Cor. 13:12 (ESV)): "For now we see in a mirror dimly, but then face to face. Now I know in part; then I shall know fully, even as I have been fully known." While Paul probably has more of a relational than an ontological knowledge in mind, the basic point is that a redeemed and restored humanity will be in a better state for self-understanding.

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CEST CONTACTS