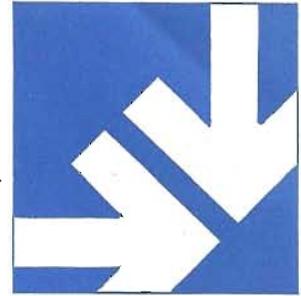
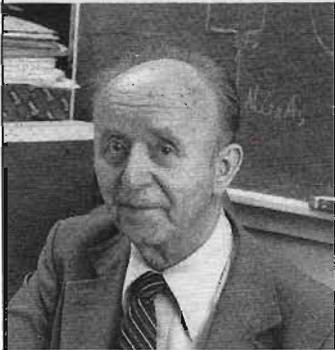


SEARCH

Scientists Who Serve God



Physicist, Engineer, Biblical Scholar



For over forty years Aldert van der Ziel has been a professor of electrical engineering at the University of Minnesota. For the past twenty years, after each twelve months in Minneapolis, he has spent three months at the U. of Florida in Gainesville as a professor. The author of fifteen books on such topics as solid state electronics, electronic noise, and semiconductors, he has also published two books on the relation of the Bible to modern science.

From The Netherlands: Education, Occupation, Emigration

Aldert was born in 1910 in Zandweer in the northern province of Groningen in The Netherlands. He studied at Groningen, the country's second oldest university, founded in 1614. For work on spectroscopy under Prof. F. A. Zernike, Aldert received a Ph.D. in physics in 1934. For the next thirteen years he did research for N. V. Philips, a huge Dutch industrial concern with many divisions. He worked on vacuum tubes and other electronic devices at the *Natuurkundig laboratorium* at Philips's *Gloeilampen fabrieken* in Eindhoven (now a major manufacturer of television tubes).



Aldert van der Ziel, right, at age 20, with a fellow physics student at the U. of Groningen, 1930.

Nazi occupation of The Netherlands lasted from 1940 to 1945. Eindhoven, in the south, was liberated by the Allies in 1944, but the war went on for eight more months through a bitterly cold Dutch winter. Many people starved; some barely survived by eating tulip bulbs. Postwar life was also grim, but in 1947 Aldert took his family to Canada. He had been invited to teach at the University of British Columbia in Vancouver.

To the United States: A Distinguished Research Career

In 1950 the van der Ziels emigrated once more, this time to Minnesota. During his tenure there, Aldert has published hundreds of scientific papers and advised many Ph.D. students on their way to important posts in industries and universities around the world.

Besides two honorary doctorates (Université Paul Sabatier in France, 1975; Eindhoven University of Technology, The Netherlands, 1981), Aldert's many honors include election to the prestigious National Academy of Engineering in the U.S. From his own professional societies, he received the Western Electric Award of A.S.E.E in 1967, the Vincent Bendix Award of A.S.E.E. in 1975, and the I.E.E.E. Education Medal in 1980.

Ω

On January 20, 1991, while this issue of SEARCH was in preparation, Aldert van der Ziel died. After retirement at age seventy, even after the onset of a progressive illness, he continued to advise students and write papers. His wife Jantina ("Tine") and former colleague Carolyne Van Vliet of the Centre de Recherches Mathématiques, U. of Montreal, Quebec, helped complete this issue. According to Tine, her husband participated in a research colloquium just ten days before he died.

Prof. van der Ziel will be missed "as a friend and as an example" by many, wrote Prof. Van Vliet, but "his works are still with us." In the Dutch Bible so familiar to Aldert, *Ned. Bybel genootschap*, that phrase in Revelation 14:13 reads:

Want hun werken volgen hen na.

A Quiet Student of Noise

IS GOD A MATHEMATICIAN?

"There is nothing mysterious about the use of mathematics in science. It comes about everywhere where quantitative determinations are made and quantitative predictions aimed at. For that reason I must take exception to the view of the famous British astronomer and theoretical physicist [Sir James] Jeans who maintained that this had important philosophical and theological implications. According to Jeans the use of mathematics in modern science indicated that 'the Architect of the Universe is a great mathematician.' In my opinion modern theoretical physics merely shows that physicists have become good mathematicians. I do not want to sound impious, but I suspect that this 'mathematician-architect of the Universe,' deduced from modern physics, is nothing but a projection of an idealized mathematical physicist against the sky and has nothing to do with the God about Whom the Christian message speaks. Christians should not try to make apologetical capital out of this role of mathematics."

—from Aldert van der Ziel, *The Natural Sciences and the Christian Message*, Minneapolis: T. S. Denison & Co., Inc., 1960, copyright by Lutheran Studies, Inc., p. 29.

At the universities of Minnesota and Florida, Aldert van der Ziel supervised the doctoral research of over eighty students. Many were attracted to his laboratory by his international reputation on the subject of "noise" in electronic tubes and conductors. His interest in that field began when he was a young industrial scientist in The Netherlands.

"What Did You Say? I Can't Hear You for the Noise!"

Everyone is familiar with noise as unwanted *sound*. A musical instrument produces a tone of a particular frequency, plus overtones harmonically related to that frequency. Random sound (including some modern "music"!) is full of overtones that are not harmonically related. "Static" breaking in on a radio broadcast during an electrical storm is random sound.

The term *noise* also applies to signals other than sound waves, such as flickers of light that might be confused with blips on a radar screen. In general, noise refers to spontaneous fluctuations interfering with any kind of signal reception or amplification. Research on noise in electronic devices has improved many methods of communication and detection of electronic signals, visible light, and infrared radiation.

Noise is especially troublesome when signals are very weak, as from an interplanetary spacecraft. Voyager 2, launched in 1977, approached the planet Uranus in 1986. Two of its instruments detected bursts of radio signals, evidence that Uranus has a magnetic field, but scientists first had to rule out electronic noise. In 1989, on its way out of our solar system, Voyager 2 detected radio emissions from Neptune also. Interference with radio signals sent back from the Pioneer Venus Orbiter circling that planet since 1978 has shown that Venus has an ionosphere.

Higher Mathematics; Down-to-Earth Applications

Aldert van der Ziel approached scientific problems with a full range of methods, from intuitive "model making" to sophisticated calculations. He claimed that his "betting rate" was better than average, and his initial approximations were often borne out later by careful mathematical and experimental work. At other times he began with a very exact study, using expertly the standard theory of differential equations he had learned at Groningen. Of one of his pioneering contributions to our understanding of semiconductors, a theoretical physicist wrote:

"Van der Ziel's theory of noise in junction devices, reported in *Proceedings of the Institute of Radio Engineers*, v. 43, pp. 1639-46 (1955), and v. 46, pp. 1019-38 (1958), was based on a transmission-line analog for the pertinent partial differential equations (with stochastic noise functions added in the sense of Langevin sources). It solved the controversy concerning Petritz's earlier theory and provided the basis for all noise spectra in bipolar junction devices. All this was done without Green functions or operator algebra as we would use nowadays."

The writer added that afterward Aldert looked for a simple corpuscular model that would give the same results. Although he did not shy away from lengthy calculations, Aldert basically believed that nature was "simple" and should be described by concise, basic equations and results. He frequently quoted the director of the industrial lab where he had worked: "If you cannot state your results in plain language, you have not understood them yourself."

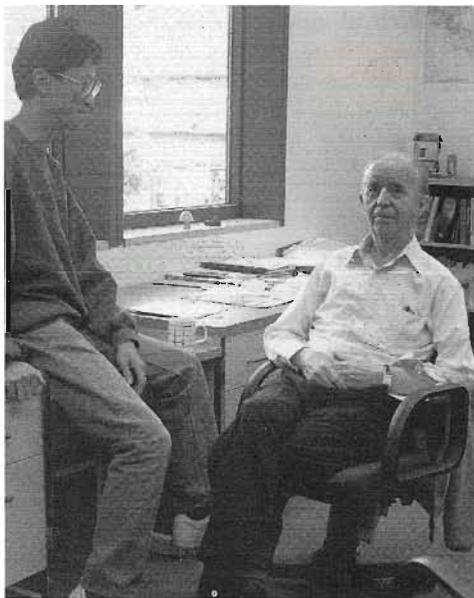
In the 1980s, Professor van der Ziel made fundamental contributions to Peter Handel's quantum $1/f$ noise theory, which explains a certain type of noise on the basis of a "fine structure constant" related to the coupling of accelerated moving charges with the electromagnetic field. Aldert confirmed Handel's formula for a large number of modern devices as well as for older measurements on vacuum tubes.

What sounds like theoretical gobbledy-gook to outsiders can have surprisingly immediate applications. Predictions from Aldert van der Ziel's work on $1/f$ noise improved the infrared detectors of military "snooperscopes," enabling U.S. forces to operate at night in the 1991 Gulf War with Iraq. Ω

Scientists and engineers study noise partly to figure out how to get rid of it. Noise is "unwanted information," clogging communication channels and degrading the quality of information handled by computers. Noise can sometimes be eliminated by inserting "narrow band pass" devices that let a desired band of frequencies pass but filter out unwanted ones.

Science as a Filtering Process

Aldert van der Ziel accepted the idea of science as "the pursuit of truth" but considered it a loaded definition because it suggests that only science is true. He felt that some scientists, perhaps to boost their own egos, define science too narrowly, excluding many fields of inquiry other than their own. He objected to the phrase *scientific method* when used to imply that only one method exists or that any investigation not fitting within its narrow framework is unscientific. In the Dutch language and tradition, the word *science* can be used for scholarship in general. Hence Aldert once wrote that Christian theology—the systematic investigation of the sources, content, and interpretation of the gospel message—should be classified as a science.



Prof. van der Ziel in his office, October 1989, with student Alister Young. Are they discussing physics or theology?

Whatever one's definition, science acts like a filter. The physical sciences, for example, exclude from their consideration nonphysical forces that cannot be measured. Since all scientists work to eliminate hypotheses that do not stand up to experimental test, science could be defined as "the pursuit of error." Its purpose is to weed out false ideas so we can see more clearly how the physical world really works.

Theology As a Filtering Process

Even when science is defined narrowly, theological investigations resemble at least the theoretical aspects of scientific work. Theologians, though more at ease than scientists with the word *truth*, also proceed by eliminating error. Theological work aims to filter out ideas that do not jibe with sound knowledge of God's Word or God's world.

Following Karl Barth, Aldert van der Ziel took a dim view of "natural theology," looking exclusively to the Bible for divine revelation. Following Gerhard von Rad, Aldert distinguished between the biblical message and what might be called the "biblical framework" in which that message is conveyed.

Every communications channel has its own kind of "noise." In communicating with humanity, God had to take a certain risk that we might be distracted by what is extraneous to the real message. To Professor van der Ziel the message was clear: we are not "making the moral grade" but Jesus Christ has done something about that. Recognizing sin as the root of human troubles could make us despair when we look at the world, Aldert believed, but God tells us that we are *forgiven* sinners. That knowledge, Aldert wrote, "does not drive us into despair but revives in us the hope and makes it possible for us to work quietly toward the solution of problems that face us." Ω

Long ago God spoke to our ancestors in many and various ways by the prophets, but in these last days he has spoken to us by a Son, whom he appointed heir of all things, through whom he also created the world. — Hebrews 1:1-2

Filtering Out What Doesn't Belong

IS THE BIBLE SCIENTIFIC?

"Concerned Christians in the past have had, and many at present still have, considerable difficulty in accepting scientific discoveries and theories concerning the world and its origin. They have feared, and many still fear, that they would have to forfeit the integrity of Scripture if they would do so. This problem had its origin in the manner in which the Biblical message, in particular the message of Genesis, was tied to 17th-century science. To overcome this difficulty, one should allow the Bible to *speak for itself*, without making premature connections with science and without introducing preconceived notions derived from science. It will then be seen that most of these problems disappear.

"For others the problem seems at first sight to be of a quite different nature. They hold the first chapters of Genesis to be an ancient *explanation and view* of the world around us, that was once useful and valid but that has now been superseded by a scientific explanation and world view. The error made here is that it is not sufficiently understood that Genesis gives in the first place a *religious, theological* message. It does not try to *explain*, but it *teaches* and *preaches* God as creator. To find that out, one must listen carefully to what Genesis tries to convey."

—from Aldert van der Ziel, *Genesis and Scientific Inquiry*, Minneapolis: T. S. Denison & Co., Inc, 1965, pp. 11-12.

The fact that scientists try to be "objective" and remain as unbiased as possible in their work does not of itself keep them from holding religious convictions. (Ironically, belief in science as the only source of knowledge is held by some with an almost religious fervor.) Aldert van der Ziel's personal religious beliefs and his range of other interests helped make him a delightful husband and father as well as a friend to many, many students.



Eindhoven, 1947, the day before Aldert and Tine left for Canada. Son Jan Peter, in front of Aldert, is now a physicist at Bell Labs. Daughter Cornelia, in foreground, is a physician. Joanna, born in Vancouver, is also a physician.

One scientist recalls being met at the airport on visits to Minneapolis: during the ride, Aldert would talk animatedly of the latest experimental findings and theoretical models of noise in whatever was under study at the time, "from vacuum tubes to submicron HEMTs." An hour later, in his home or at the Campus Club, Aldert would be talking about theologian Rudolph Bultmann, Gerhard von Rad, or cosmology and Einstein's general relativity (the necessity of which Aldert felt was still open to debate).

High Standards, but Humane Treatment

Prof. van der Ziel trained some outstanding scientists and engineers but he was also a "father" to some less gifted students. On one occasion one of his students gave a rather weak defense of his doctoral dissertation. It is rumored that afterward the professor said to the committee, "Look, we need some students like this one, to maintain the normal average." After some discussion the committee voted to pass the student, who now does respectable scholarly work at a school not quite in the top rank.



Eindhoven, 1981, when Aldert returned to receive an honorary doctorate.

In one sense Aldert's work was his life, but the human aspects were never far from his soul. Former students remember the long hours they put in to get the experimental results he wanted to see, but also his compassion toward their human needs. They remember his lab, but also being in his *home*. His wife Tine was an essential part of his own support system, typing and retyping his manuscripts and making that home what it should be.

Not a Hierarchy, but a Fellowship of Scientists

A yearly picnic in the van der Ziel yard brought together all the lab workers and their families, spreading blankets on the grass for their children. With Americans, Chinese, Taiwanese, Japanese, Koreans, Greeks, Iranians, Indians, and various other nationalities (including Dutch), it was like a little United Nations: a community with a common bond, at peace.

Aldert never saw the gradation from pure science to applied science to engineering to technology as any kind of hierarchy. He noted that those who see it that way generally put themselves at the top. He felt that the borderline between science and engineering was becoming less distinct, and he liked it that way.

Aldert van der Ziel was a long-time Fellow of the American Scientific Affiliation (ASA), a fellowship of Christians in science and technology. For many ASA members he was an inspiration, as though both his life and his work were saying,

Beproeft alle dingen; behoudt het goede.
("Test everything; hold fast to what is good,"
1 Thessalonians 2:21.)

Ω

Thoughtful Worship

A Well-Rounded Life

SEARCH

This issue of SEARCH (No. 14) was prepared by Walter R. Hearn of Berkeley, California. Design by Nancy C. Hanger; layout by ASA managing editor Rebecca Petersen. Opinions expressed in SEARCH are those of individuals and may not be representative of the entire ASA membership. Scripture quotations are from the New Revised Standard Version (1989) unless otherwise noted.

© Copyright 1991 by American Scientific Affiliation. All rights reserved.

SEARCH brings scientific questions to the attention of pastors and the Christian public by focusing on the work of Christians in science. SEARCH is an occasional publication of the American Scientific Affiliation (ASA), Robert L. Herrmann, executive director. To obtain a free single copy, send stamped, self-addressed envelope to: ASA, P.O. Box 668, Ipswich, MA 01938. Be sure to state the number of the issue being requested. Multiple copies to one address: 15 cents/copy plus \$1.50 postage and handling charge; prepaid orders only, please.

The 1989 version of ASA's 48-page guidebook, *Teaching Science in a Climate of Controversy*, helps teachers cope with questions of science and religion. It is available postpaid from ASA at \$6 for one copy, \$5 each for 2-9 copies, \$4 each for 10 or more copies.

For information on ASA Annual Meetings, other ASA publications, or how to become a Member, Associate, or Friend of ASA, write to: ASA, P.O. Box 668, Ipswich, MA 01938.