SEARCH

Scientists Who Serve God

SHE SOLVES CHEMICAL PUZZLES

At Lilly Research Laboratories in Indianapolis, Ann Hampton Hunt's title is Research Scientist. She has a Ph.D. in physical chemistry, and within that field her specialty has been nuclear magnetic resonance (NMR) spectroscopy (pronounced speck-TRAHSS-kup-ee).

Ann Hunt is thus an "N-M-R speck-TRAHSS-kup-ist," a mouthful even in its abbreviated form. Although she lives "out in the countryside" in Indiana, she seems to have come a long way from her birthplace in rural Lexington, North Carolina. She grew up on a family farm near Denton, North Carolina.

Ann's parents provided a lot of educational encouragement for Ann and her sister and brother. Her mother was a former high school science teacher and her father operated a poultry hatchery and feed store. "At times Dad was his own best customer," Ann recalls. He had a degree in agricultural education and liked both farming and teaching. Eventually he completed an Ed.D. at Duke University and became president of a community college.

Beginning a research career

A good background in mathematics is an asset in almost any branch of science. Ann entered the University of North Carolina at Greensboro as a math major, later switched to chemistry. After graduating with Phi Beta Kappa honors, she continued in chemistry at Duke. In graduate school she studied chemical reactions with the aid of NMR, then a relatively new technique. Ann completed the Ph.D. requirements in August 1969 and began teaching chemistry at Converse College in South Carolina. Her degree was awarded at Duke's commencement exercises in May 1970.

Hunt spent the summers of 1970 and 1971 doing research at Louisiana State University in Baton Rouge, in a program for college teachers funded by the National Science Foundation. In fall 1971 she took a postdoctoral research position at the M. D. Anderson Hospital & Tumor Institute in Houston, Texas, where she worked for two years on biochemical problems.

Moving to Massachusetts, the young chemist enrolled at Gordon-Conwell Theological Seminary, first as a full-time resident student, then as a part-time student, earning a Master of Theological Studies degree in 1976. Ann supported herself first by teaching part-time at North Shore Community College in Beverly, then as a research fellow in biochemistry at Harvard Medical School. In 1978 she went to work for the pharmaceutical firm of Eli Lilly & Co., and was promoted to her present title in 1983.

A life of discovery

Ann Hunt's laboratory at Lilly uses NMR spectroscopy and other sophisticated analytical tools to help company scientists figure out exactly what compounds they're working with. The two-dozen papers Dr. Hunt has published in chemical journals are full of names like actaplanin, N-methylstreptothricin, and "3-oxa-5-carba analogues of *beta*-lactam antibiotics." (For *their* pronunciation, you're on your own.) She finds the work challenging, often exciting, sometimes tedious and difficult.

Yet Ann Hunt is one scientist able to look beyond technical details to a bigger picture of what life is all about. Her master's degree in theology helps her focus on eternal dimensions, but the key factor is an abiding personal faith, held since her college days. One might say that Ann has lived a life of discovery outside the lab as well as in it. And at the very beginning of her scientific career, Ann Hunt discovered Jesus Christ.

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Scientific Investigation

PUTTING CLUE AND CLUE TOGETHER

Chemists love to draw structural formulas of the molecules they work on. Since molecules are too small to see, how do chemists know what to draw? They get clues by using probes, like somebody who throws rocks into a dark cave, then tries to decide from the growls what kind of animal is in there.

When a chemical compound absorbs electromagnetic energy, the frequencies it absorbs give clues to its structure. For example, molecules built in certain ways show color because they absorb visible light of other colors. When higher-energy ultraviolet frequencies (UV) or lower-energy infrared frequencies (IR) are absorbed, chemists obtain other kinds of structural information. (*Spectrum*, a range of frequencies, is singular; *spectra*, plural.)

How nuclear magnetic resonance works

In NMR spectroscopy, radio-frequency energy of about 60 MHz (megaHertz, or million cycles/sec) is beamed into a compound held in a very strong magnetic field. Certain atoms have a nucleus (the N in NMR) with a property called "spin" that makes it behave like a tiny magnet (the M). Fine tuning of the radio frequency can make such nuclei reverse their N and S poles. That flip-over process absorbs energy at a specific resonance frequency (the R), recorded by the NMR spectrometer.

NMR is especially useful because (1) most organic compounds contain lots of hydrogen (chemical symbol, H); (2) the nucleus of the H atom (a single proton) has the spin property; and (3) the resonance frequency of each H atom shows a "chemical shift" depending on what that atom is attached to. So, each hydrogen-containing compound yields a unique NMR spectrum of absorption peaks. From the size of the peaks, a chemist like Ann Hunt can "count" the number of H atoms at each chemical shift. What's more, she can compare a compound's NMR spectrum with the spectra of known compounds to see what kinds of adjacent groups of atoms could produce each NMR peak in the spectrum of the mystery compound.

Solving riddles of chemical structure

Many pharmaceuticals are synthetic compounds. Others are "natural products" from animals, plants, or bacteria. Chemists in a company like Lilly may want to know if the "new antibiotic" they've isolated from a fermentation broth is really new. That's the easier part of Ann Hunt's job, getting an NMR "fingerprint" and comparing it with the spectra of known antibiotics.

Hunt's job is more challenging when she has to intrepret a spectrum to identify an unknown compound. She recalls one puzzler that was a potentially important drug. It was known to block a certain disease process but its structure was a mystery. On a holiday, Ann went to her lab to wait for the city's fireworks display to begin. She sat at her desk studying the complex NMR spectrum one more time. At last certain features began to fit together. She kept testing her ideas until finally the whole structure fell into place.

"That one was really exciting," she says, "like fireworks going off inside my head. I drew the structure that fit all the data and stuck it on the doors of my colleagues' labs. By then the real fireworks display was beginning, so I went out to watch without even calling them to say I had found the answer."

Ann Hunt stands near the magnet (11.7 Tesla) while fellow ASA member Richard Justice operates the computer of a 500 MHz NMR spectrometer at the Lilly Research Laboratories.

"HUNTING" FOR NEW MEDICINES

The company Ann Hunt works for is one of the world's ten largest pharmaceutical companies (once called "drug houses" without any bad connotations). Eli Lilly & Co. was founded in 1876 by a Civil War veteran fed up with the poorly prepared, ineffective medicines of his day.

Today the company sells its products in 130 countries. Most of those products were developed in its own laboratories, which now keep over 3,000 employees busy on as many as 50 potential new drugs at any one time. In 1926 Lilly opened its own clinic in an Indianapolis hospital to do clinical testing of the most promising ones.

Lilly once manufactured the insulin that keeps diabetics alive by laboriously processing animal pancreases. Lilly's human insulin (Humulin™), made by gene-altered bacteria, became the first pharmaceutical agent produced by recombinant DNA techniques to reach the market. Lilly also markets antibiotics, medicines to treat heart disease and clinical depression, and even some products used in agriculture.

Lilly spends over $500 million a year on research, but for any new drug to reach the market now requires an average of over $125 million spread out over eight to twelve years.

Theological Reflection

GOD CARES ABOUT DETAILS

Physicists and chemists can write precise mathematical equations describing the behavior of many things in the natural world. To discover such a "natural law" is an impressive but relatively rare accomplishment. Scientists spend much of their time simply tackling one puzzling problem after another. Even in routine tasks, though, they must pay attention to detail.

In that sense at least, Christian faith and scientific work have a lot in common. Theology may make grandiose statements about eternal truth, but without careful testing in individual lives, theological formulations have little practical value. Much of the time, Christians are engaged in honoring God by serving specific people in specific circumstances. That's the way theories about God are applied in real life.

Even a sparrow "counts"

Jesus once encouraged his disciples by telling them that God cared about sparrows priced at less than a penny each. He said that "even the hairs of your head are all numbered. Fear not, therefore; you are of more value than many sparrows" (Matthew 10:28-30). His heavenly Father didn't overlook small details. In one parable, servants who carried out a minor assignment were told that because of their faithfulness in little things they would be given greater responsibilities. Jesus then listed some "routine assignments" for God's servants: feeding people who hunger and thirst, clothing the needy, and caring for prisoners and the sick (Matthew 25:14-46).

"Taking care of business" in Christ's name means doing some things that may not seem of world-class importance at the time. But when Ann Hunt is working on a chemical structure, she does it with care whether or not that particular compound will ever make it to the marketplace as a new pharmaceutical agent. Similarly, she tries to serve God well outside the lab, whether on the national Council of the American Chemical Society or teaching an adult Bible class at Southport Presbyterian Church in Indianapolis.

Doing the job, and enjoying it

It is a privilege to be part of an enterprise as important as science, even in its routine aspects. The Christian enterprise offers a special sense of participating with God. Christians should *care* about what they do—because God cares how things are done.

Caring for people is often tough. Love that matters is not a grand feeling but a specific course of action in a real situation. To an outsider, some aspects of the Christian life must seem like "scut work." Yet to know Jesus Christ from the inside puts us in intimate touch with the Creator of everything that exists. To be alive to God's presence can make a world of difference in doing everyday tasks.

And, on occasion, it's like feeling fireworks in our souls.

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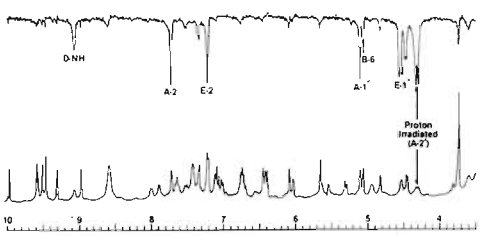
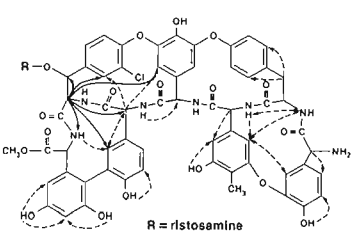
At left, an NMR spectrum; at right, the structural formula of the compound that produced it. The solid & dotted arrows, not part of the structure, indicate special effects of nearby groups. Not all the hydrogen atoms in the molecule are shown by the symbol H. The R stands for part of the original molecule removed before obtaining the NMR spectrum.





THE NUMBERS GAME

Critics charge that few U.S. high school graduates are literate. Scientists worry because even fewer are "numerate." Science depends on mathematics.

Not everyone needs to understand higher math, but an ability to "play with numbers"—to think quantitatively—is useful in many situations. It is absolutely essential for anyone planning to study science. To get more Christian young people to enter scientific careers, we should encourage them to develop an early interest in math.

Numbers occur throughout the Bible, used both in a precise way and metaphorically for their symbolic value. Some interpreters construct complex schemes by assigning a numeric value to each Hebrew or Greek letter. With sufficiently flexible rules for manipulation, elaborate messages can be "found" buried in a text. That type of mystical numerology, called *gematriya* by Hassidic Jewish scholars, is not at all what science is based on.

To make their way in science, or even to be thoughtful citizens in a science-based society, young people must learn to handle basic math. The stepping stones to science are arithmetic, algebra, geometry, trigonometry, and calculus.

It seems fair to say that God loves mathematics, since the world is created to function in a mathematically precise way. In fact, that's what enables scientists to discover "natural laws."

Thoughtful Worship

ONE STEP AT A TIME

When Ann Hunt chose to follow a scientific career she knew relatively little about science and had no clear idea where such a commitment might take her.

The same could be said about her choice to follow Jesus. Ann's life has not been like driving down a freeway stretching for miles ahead so she could see exactly where she was going. In Psalms 119:105 the word of God is called a lamp to our feet and a light to our path. What the Lord promises to show us is not necesssarily the whole path, but our next step.

Hops, skips, and jumps

Much is said in the New Testament about "the Christian walk"—which sounds like moving steadily along, one step at a time. A few episodes in Ann Hunt's life were more like a hop, skip, or jump. At critical points, God seemed to guide her in rather direct ways. Her Christian life has often been closely intertwined with her professional life. One influence on both was her college roommate, a biology major who introduced Ann to Jesus Christ. Inter-Varsity Christian Fellowship put her in touch with other Christians, some of them in the sciences.

In the early 1970s, a Christian chemistry professor at LSU introduced Ann to the American Scientific Affiliation, a national fellowship of evangelical Christians in scientific work. In 1982 Ann Hunt became the first woman elected to ASA's Executive Council—and in 1986 its first woman president. At one ASA meeting, Ann met a Christian biologist from England doing postdoctoral work in the U.S. Through him she later learned of a research position open at Harvard, just when she needed it.

Presiding at the 1986 meeting of the American Scientific Affiliation.

In 1985 ASA held a joint conference at Oxford University with a British group called the Research Scientists Christian Fellowship. Ann was able to extend her Oxford trip to lecture at the Lilly Research Centre in Surrey and to attend a London meeting of the Society for Magnetic Resonance in Medicine.

Going the distance with God

Not all Christians speak freely about God's direct influence on their present lives. Yet life is a passing stream. We reflect on the past and anticipate the future, but we can function only in the present. The apostle Paul summed up the enduring qualities as faith, hope, and love (1 Corinthians 13:13). Faith can be thought of as the capacity to see God at work in the past, hope as the capacity to see God at work in the future, and love as the capacity to work with God in the present.

Ann Hunt can look back and see how God has led her, in small steps and major leaps. She has seen her work as a chemist facilitate the search for new medicines. Along the way she has represented Jesus Christ to students and to colleagues. She is able to integrate theological insights with her scientific outlook. Without trying to figure out what has been most important, she is willing to give God full credit. Ann is still on the path.

In all your ways acknowledge him,
and he will make straight your paths.

Proverbs 3:6

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