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A FIRESIDE CHAT with Leon Zelby

ETHICS AND TECHNOLOGY

In recent years, the expected and actual functions of universities have grown to cover many aspects of contemporary life. In this growth, it is necessary to remind ourselves that in spite of any needs that an university is called upon to fill, one of its functions must remain unencumbered: that of freedom of inquiry. This freedom of inquiry is probably more important now than ever before because of the complex issues confounded by oratories of many groups whose vested interest in these issues are not always evident. It is through an objective, dispassionate inquiry by a body whose prime interest should be the determination of validity of an issue, the truth of its premises and conclusions, that an university can contribute to the society at least as much as through the fulfillment of its many other obligations.

Consequently, as an university professor I consider it my duty to raise questions, questions to which I may have personal answers, but primarily questions whose study may require substantial departure from the currently accepted standards or convictions in order to test their validity, in order that the answers stand up to the scrutiny of logical analysis in view of past and present facts and experiences.

Leon W. Zelby

School of Electrical Engineering
University of Oklahoma
Norman, Oklahoma

Some years ago, Socrates told the following story to Phaedrus: Many, many years ago a famous old god Theuth, an inventor of many arts such as arithmetic and astronomy and dice and the use of letters, came to the god Thamus, the king of the region, and showed him the inventions desiring that Thamus' subjects be allowed to have the benefit of them. When it came to use of letters, Theuth said that it will make the people wiser and give them better memories. "It is a specific both for the memory and for the wit," he said. To which Thamus replied: "O most ingenious Theuth, the parent or inventor of an art is not always the best judge of the utility or inutility of his own inventions to the users of them. And in this instance, you who are the father of letters from a paternal love of your children have been led to attribute to them a quality which they cannot have; for this discovery of yours will create forgetfulness in the learners' souls, because they will not use their memories; they will trust to the external written characters and not remember of themselves. The specific you have discovered is an aid not to memory but to reminiscence, and you give your disciples not truth, but only the semblance of truth; they will be hearers of many things and will have learned nothing; they will appear to be omniscient and will generally known nothing; they will be tiresome company, having the show of wisdom without the reality."

This story is applicable even now, especially with respect to the many technological innovations that presumably were to release us from the boredom of routine and lead to more creative tasks. Instead of taking advantage of the technological tools, we became slaves to those inventions, and simply substituted one routine for another, losing in the process such skills as reading, speaking, arithmetic, not unlike Thamus had observed we would. We frequently mistake glibness and banal but sesquipedalian phrases for erudition, and the use of calculators or computers for mathematical ability. And I say this not because I do not like technology. On the contrary, I enjoy it — it would be difficult not to follow a concert I attended last week, the food and drink so readily available; comfortable travel, lodging, clothes — but that does not mean that I should not view its impact upon our society beyond the short-term conveniences and comforts it affords us; that I should not try to consider some of the rather obvious but less debated aspects of its use. If in the process I will touch upon some well known issue, please remember that it is only because "it would be superfluous to state the obvious were it not for the universal neglect thereof."

I should like to discuss some aspects of ethics and technology along three lines, one of which views technology as a scapegoat for our own shortcomings. The second line of inquiry addresses the possibility that our ethics have really not changed but that we have become more exposed to the infractions of our ethical precepts through expanded communication; and the third line of inquiry addresses the relatively unchanging ethics over the centuries in spite of substantial changes in our lifestyles resulting from technological developments. To this purpose, we need to define what we mean by ethics and by technology.

Ethics is defined as a system of moral principles; the rules of conduct recognized in respect to a particular class of human actions, or a particular group, culture, etc. (Moral: the right conduct, as right or wrong.) Technology, for the purpose of this discussion must be defined more broadly than in most dictionaries in which it is usually referred to as a branch of knowledge dealing with applied science, etc. For our purpose, technology is the use of any tool, whether it be a rock, stick, a computer, or nuclear reactor.

These definitions are relatively clear and simple. The difficulty arises when we try to determine what is right or wrong, and how the two (E&T) affect each other both in the determination and in practice of what is right or wrong. Although this particular point will be discussed more extensively in the latter part of this presentation, I would like to point out that I do not view moral or ethical principles as absolute, recognizing at the same time that there are those to whom such principles represent eternal invariants.

An additional difficulty in discussing E&T is that it is an inexhaustible subject because it deals with every facet of modern life. I shall try, however, to make it as simple as possible, but not simpler — to quote one of the favorite phrases of Albert Einstein.

Let us then address ourselves to the first line of inquiry: that technology is neutral, but that we try to use it as a scapegoat to vindicate or justify, our weaknesses, shortcomings, idiosyncrasies, foibles. Nevertheless, even though technology is neutral, it imposes specific relationships between the individuals that use it. One of the simplest examples is the cross-cut saw handled by two people: To be used effectively, one must pull when the other pushes. When both pull simultaneously, nothing will happen; when both push, the saw may break. And so it is with other technological inventions: for some, the automobile is nothing more than a means for transportation, for moving relatively conveniently and swiftly from point A to point B. For others, it provides a whole host of Walter Mitty personifications, gives a feeling of power, superiority, sometimes anonymity. It evokes myriad of images, some good, some bad. To some, the automobile becomes their *alter ego*, and a better one then themselves judging by the care lavished upon it. No matter how it is used, however, it imposes certain relationships between one driver and all the other drivers, pedestrians, traffic signals, etc., in addition to, or maybe because of, any psychological effects driving an automobile may have.

And so, too, is with other tools: the flail, the wheel, the stethoscope, to computer, each imposes a specific relationship between its user, or groups of users, and others; but note that the tool *must be used*, or must have potential for use (e.g. a threat to use a weapon), in order to produce an effect. Nor is it unusual for a particular technology to have either beneficial or harmful effects depending upon its use; or even the same use but for different purpose. For instance, to use a weapon to attack is thought to be worse than using the same weapon for defense.

The automobile, however, or the computer, or the drug does not select the specific function to which it is put nor the particular feeling it evokes. It is true that its designer or its manufacturer possibly could — by a modification of the design, whether technical or cosmetic — focus on a particular function, or on psychological factors. As a matter of fact, in many respects both of them do by catering to the artificially developed tastes and desires of the public through years of advertising in order to maintain, nay increase, sales and profits, a characteristic of our society, and to do it the fastest possible way.

In all this, we need also to remember that technology is not restricted to high technology of today, but includes the planting stick, the irrigation ditches, the stone tools which represented high technology of yesteryears. Actually, the whole problem may be not so much with technology but with too much of it, i.e. not automobiles *per se*, but too many of them; not TV sets or computers, but too many of them, etc. And more TVs require more TV stations, and more programs — and quantity could never really be equated to quality. Remember Aristotle's golden mean?

Technology is neutral and inanimate. It needs activation and guidance; and the claims that it is bad simply refer to the character of its inventors, designers, producers and users rather than to technology itself. The critics of technology do not disdain its use. On the contrary, they take full advantage of it, whether it is Ellul or Vonnegut. One cannot shirk the responsibility for the impact of technology by blaming it for our own weaknesses. Human nature is responsible both for the development and for the use of technology, in spite of the claim of some that there is no such thing as "human nature." These claims simply ignore the body of existing evidence: There are very few indeed, if any, indications of any sterling human qualities from the non-technological garden of Eden, through Jacob and Essau to the Teton Dam disaster. The Bible, Hammurabi's code and others give mute testimony to the need for protection from the predatory, greedy nature of human actions which we now wish to attribute to technology, wish to rationalize away as we do with many other issues. After all, technology *is* a human invention!

Which brings us to the second point: we are more exposed and to a greater amount of information at a faster rate of diffusion than ever before. The information being current, instant camera so to speak, cannot help having a greater impact than if it were

delayed. Then, too, is the type of information that gets priority, and that is the one apparently preferred by the majority of readers, listeners, and viewers. Judging by the headlines, gossip columns and "popular" programs, most of the appeal will not be directed to our best qualities.

Pursuit of what is believed an economic truth — growth — has led to a mad scramble to lay bare and scrutinize endlessly (simply because the public will buy it) infractions of ethics, laws, rules by individuals and organizations. The bad influence of this overexposure may also be due to large quantities rather than to the activities themselves: too many magazines, radio and TV stations, reporters, advertisers — and mostly too many people.

It is difficult to adhere to an inculcated code of ethics when our leaders follow, or at least seem to, double standards: one for themselves, and a different one for the rest. And I am not necessarily referring just to Watergate, but to the congress exempting itself from Affirmative Action, for instance; business deductions for entertainment that are acceptable for some, but considered bribery for others; to those cases in which some are lucky enough to have influence or be able to afford competent lawyers and get off more lightly than others for similar transgressions. All this, however, is not new and cannot be attributed to technology. It reflects simply the structure of our society, a society that condones certain practices especially when they are supported by extensive propaganda, by a successful appeal to emotions masquerading as reason.

If we are to rely on historical information, people were always interested in gossip to learn, or hear, of others less forthright, upright, decent than themselves and rejoice in that; or about those well off to envy them and to invent real or imaginary injustices that led to such inequitable distribution of talent, ability, beauty, wealth. (Sort of brings us back to human nature, does it not?) Who has not read of Nero, or the Borgias, or de Medici? But in their days, the average citizen was more concerned with games and with satisfying his needs, or wants rather, than with the depredations of members of the leading class. Except for the current deluge of information, this has not really changed much because the majority still seems to enjoy someone else's misfortunes, whether through Watergate and Bert Lance's hearings, or soap operas, or slapstick comedy. No, technology has not affected our ethics, although it may have broadened our perception of it.

We now come to the most controversial part of the talk: an inquiry into the validity of the ethics developed by our forebears in the contemporary, technological society. Our lifestyles have changed, yet we have been attempting to adhere to a code of ethics devised under a completely different environment, different set of circumstances. In the Judeo-Christian religious environment, it is sheer heresy even to consider alternatives to the Ten Commandments, and to the Seven Deadly Sins. Yet, Christianity as such as represented a schism, just as did Calvinism, Lutheranism, the entire Reformation movement. Even if all the religious sects now in existence adhere to the Ten Commandments as an absolute truth, this in itself cannot constitute a proof that is is unequivocally so. Christianity represents only a fraction of the World's population. We have a tendency to conservatism, especially insofar as beliefs, convictions, or doctrines are concerned. According to Eric Hoffer, the viability of a doctrine, in this case the ethics, lies in that it is not verifiable, and if verifiable, it must be vague.

The Ten Commandments and the Seven Deadly Sins postulate one form of behavior, whereas the economy and full employment depend upon desires for more worldly goods, greater comfort, faster transportation, more leisure. This clearly represents a conflict, for no semantic expostulations can disguise covetousness, lust and gluttony through the euphemism of "healthy economy," or "economic growth." In this light, it would not be strange if one speculated that the Commandments and Sins were contrived by a class intent on protecting itself and its wealth by way of taboos, or dogmas, considering the relatively primitive state of development of the coeval civilization. Times have changed, however, so that in view of the substantial changes in our lifestyles, and concern by some about ethics and the effect of technology upon it, maybe it is time to review the entire concept of our ethical standards. Some consider our code as absolute, unchanging. Yet, though many claim fundamentalism, not all of those fully practice it; though many preach righteousness, not all of those practice it.

Well, what are some of the aspects of our ethics we may look upon critically? Thou shalt not steal? That was in times when stealing was from another person, or another family, a human entity so to speak. What about stealing from a corporation, a concept of an agency devoid of human characteristics, an entity released by law from many responsibilities, owned by an amorphous mass of stockholders and run by "professional" managers rather than owners. Thou shalt not kill? That was in times when every soul was needed to help till the soil, or protect the flocks. Now, with only a fraction of the population providing food, and with high levels of unemployment, does it still hold true? How can the Seven Deadly Sins compete with the economists' and politicians' contentions that the economy must grow at almost any cost? Is it not just an euphemism that substitutes a healthy (whatever that means) growth of economy for lust, gluttony, covetousness? Is not "keeping up with the Joneses" just an euphemism for envy and pride?

Technology helped increase the lifespan, but in the process helped also dilute our gene pool. Antibiotics, penicillin, pacemakers are only about a generation old, so that we are not yet fully aware of the long-range consequences of propagating hereditary diseases by the use of these medications. Radiation therapy of thirty years ago is *now* known to have contributed to an increase in the incidence of cancer. But medical technology is not the only one that may dilute our physical and mental facilities. The automobile is already being held responsible in some measure for the decrease in physical fitness and, as such, a contributory factor in the incidence of cardiovascular diseases. The computer is too new to be blamed for contributing to the atrophy of the brain — whether this will be hereditary is also too early to tell, though the popularity of its use can be explained by the observation of Bertrand Russell's that "Men fear thought as they fear nothing else on earth — more than ruin, more even than death." Signs of such atrophy are beginning to crop up, however, supporting the observation of the good god Thamus.

We send food to starving nations without thinking that this may mean a greater number of starving people in the years to come. We do this to salve our consciences and escape the pictures of starving children in the newspapers and on TV screens presented there either as news or as advertisements by philantropic organizations.

Our ethics tell us that to preserve life is good; but the laws stipulate certain conditions, for instance, when an abortion is legal, and under what circumstances the government should pay for it. We think that insulin, antibiotics, prostheses, and other kinds of medication good; the atomic bomb, weapons, bad. At the same time, we subsidize tobacco growers in spite of the deleterious effects of tobacco smoking; and extend computer use to personal data storage and education as a boon rather than as a potential menace.

Where does all this leave us? First, I think that we tend to forget that technology is a human creation. We also tend to deny the possibility that so are our ethics. How else could one explain the fact that we try to keep the ethics intact

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NEW CHAPTER at North Carolina A and T Univ.

by Harold L. Martin

The Theta Nu Chapter of Eta Kappa Nu was installed at N.C.A & T State University in Greensboro, North Carolina on April 11, 1980 with the initiation of thirteen charter members. These new members are: Jannie L. Jones, Bryan Riley, Earl Mathis, M. Hashem Anwari, Wilfred A. Tanner, Patricia Armstrong, Timothy Wilder, Darrell Shelton, Everett Drew, Carl Hayes, James M. Vincent, Jr., Winser E. Alexander, and Anita Whichard. It is interesting to note that three of the thirteen initiates are women, which is an indication of the growing number of women entering the various areas of engineering throughout the country.

Old members, faculty, and friends were on hand to witness the installation ceremony, which was handled by Mr. Larry Dwon, a past president of Eta Kappa Nu and the official historian of Eta Kappa Nu. In addition, Mr. Dwon was kind enough to double as the guest speaker at the installation banquet that followed the installation ceremony. The theme of Mr. Dwon's talk was "The History of Eta Kappa Nu", in view of the fact that Eta Kappa Nu celebrated its 75th anniversary on October 28, 1979.

The new members of Theta Nu Chapter are very enthusiastic about the future and we expect many great things to grow out of this professional organization. Many activities are planned for the 1980-81 school year. Hopefully, these activities will become part of the yearly tradition here at N. C. A & T State University.

THE ETA KAPPA NU COLLEGE OF BENEFACTORS

SUPREME BENEFACTOR

Edith Ann Koerner

HIGH BENEFACTOR

Helene Koerner Gahlen

Lloyd Hunt

Fritz A. Koerner

BENEFACTOR

Marc Dodson

Larry Dwon

Irma Hanson

Fred Harrell

Edward Jordan

Eugene Mueser

Everett S. Lee

Howard H. Sheppard

Joanne Waite

NEW OFFICERS AND DIRECTORS

Sydney Parker
President

Sydney R. Parker received the B.E.E. degree from the City College of New York and the M.S. and Sc.D. degrees from the Stevens Institute of Technology, Hoboken, New Jersey. His major area of doctoral study was in Electrical Engineering with a minor in Mathematics.

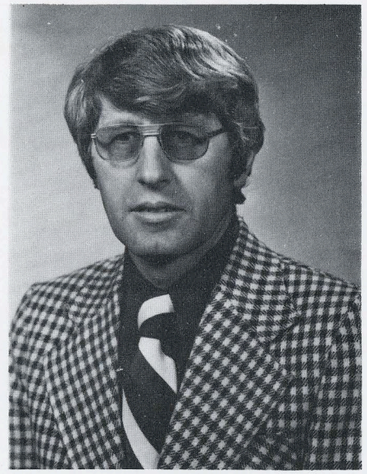
He served as an officer in the U.S. Army Signal Corps from 1944 through 1946 and attended the Radar Schools at Harvard University and the Massachusetts Institute of Technology. He then taught in the Electrical Engineering Departments of the City College of New York and the Massachusetts Institute of Technology. In 1952 he joined the Advanced Development Group of the Radio Corporation of America where he was a Project Engineer working on the early development of analog and digital electronic computers. In 1956 he rejoined the Department of Electrical Engineering at the City College of New York as an Assistant Professor, leaving in 1965 as an Associate Professor to become Professor of Electrical Engineering at the Cullen College of Engineering, University of Houston, Houston, Texas. In 1966 he joined the faculty of the Naval Postgraduate School in Monterey, California as Professor of Electrical Engineering. In 1970 he was appointed Chairman of the Department of Electrical Engineering at the Naval Postgraduate School, leaving in July 1975 to become Professor of Electrical Engineering and Computer Science as well as Dean of the College of Engineering at Rutgers University, New Brunswick, New Jersey. He returned to the Naval Postgraduate School in July 1976.

Dr. Parker is co-author of a well known textbook, "Principles of Control Systems Engineering" (McGraw Hill 1960) and has published over 50 major technical papers and monographs. His research has been recognized by his election as a Fellow of the Institute of Electrical and Electronic Engineers (IEEE) for "contributions to circuit and systems theory". His most recent research interests and publications are in the areas of computer-aided circuit analysis and design, sensitivity studies, and digital (discrete time) filters. He is currently an Associate Editor of the IEEE Transactions on Circuits and Systems. He has also been an Associate Editor for a special issue on Computer Aided Design of the IEEE Transactions on Circuit Theory.

Dr. Parker has been a consultant to several publishers and industrial organizations including the McGraw-Hill Book Company, Pergamon Press, the McMillan Company (series editor), North American Rockwell Corporation, Automation Dynamics Corporation, and others.

Russell E. Lueg
Vice President

Russell E. Lueg earned degrees as follows: B.S.E.E. in 1951 from the University of Arkansas; M.S.E.E. and Ph.D. in 1956 and 1961, respectively, from the University of Texas in Austin. He served in the U.S. Air Force from 1951 to 1953 and is currently a Lt. Col. in the Reserves. He worked as a Program Engineer from 1953 to 1954 for General Electric and after graduate school in 1960 he joined the faculty at The University of Alabama. A professor of electrical engineering from 1964 to the present he served for two years as acting head of his department. He has worked on various contracts with NASA, the Army Missile Command and the U.S. Navy. He is the author or co-author of three textbooks on electronics and/or electric circuits and has contributed several papers to meetings and journals. He is a senior member of IEEE. He has served as president of the Alabama Society of Professional Engineers and is a registered P.E. For eight summers from 1969 to 1977 he directed or assisted in the direction of the 11 week NASA/ASEE summer faculty fellowship programs in Engineering Systems Designs conducted at the Marshall Space Flight Center in Huntsville, Alabama. He is a member of Tau Beta Pi and Eta Kappa Nu and has served as faculty advisor to the Delta Nu Chapter at The University of Alabama since 1961.



Virgil Ellerbruch
Director

Virgil George Ellerbruch was born in Bloomfield, Nebraska and at the age of five years the family moved to Wyoming. All schooling was in Wyoming. Higher education began with the two-year college in Casper and ended with the Ph.D. at the University of Wyoming.

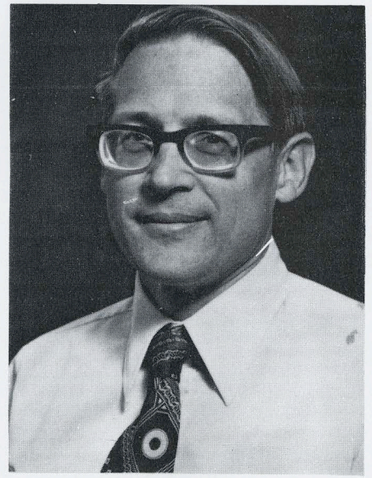
Kinnear, Dubois, Lander, Casper, Cheyenne and Laramie have all been residence cities in Wyoming. A small school at Kinnear was attended for ten years and then a move made to Lander. The high school graduating class at Lander had 34, so like many South Dakota students the schools attended were rather small.

Five years were spent as an automotive engine rebuilder before and while attending college. Industrial experience with missile systems was gained at Cheyenne and Salt Lake City, Utah.

Present professional interests are in electronics and microcomputer systems. A strong interest in undergraduate and graduate teaching also creates much satisfaction. Research activity has always been agricultural related. The Ph.D. dissertation was with the microbiology department at the University of Wyoming.

Dr. Ellerbruch is a member of Eta Kappa Nu, Sigma Tau, Phi Kappa Phi, and Tau Beta Pi honor societies. He is a past member of Sigma Xi. Professional memberships are held in NSPE (National Society of Professional Engineers), IEEE (Institute of Electrical and Electronic Engineers), ASEE (American Society of Engineering Educators) and SDES (South Dakota Engineering Society). Memberships are held in Kiwanis and Mt. Calvary Lutheran Church.

The Ellerbruch family includes his wife, Georgan, three daughters and one son. Hobbies include family activities such as sailboating, water skiing and pool, and also square dancing. Spectator sports are also enjoyed.



Harold Knudson
Director

Harold K. Knudson was born in San Francisco, California in 1936, and received all his early education there. He received his undergraduate education at San Francisco City College and at the University of California at Berkeley, receiving his B.S.E.E. degree in 1958. He continued his studies at the University of California, receiving his M.S. and Ph.D. degrees in 1960 and 1962, respectively.

After receiving his Ph.D., he joined the staff of the M.I.T. Lincoln Laboratory where he studied problems in optimal control and digitial differential analyzers. In 1966, he joined the Department of Electrical Engineering at the University of New Mexico where he presently holds the rank of Professor of Electrical Engineering and Computer Science. His main areas of activity have been in applications of system theory and in digital system design. In the last several years he has become heavily involved in the design of microprocessor bases systems and in applications of microprocessors in control. He has consulted on state estimation problems for the Public Service Company of New Mexico, and has taught short courses in methods of digital design.

Dr. Knudsen is a member of Eta Kappa Nu, Tau Beta Pi, Sigma Xi, Phi Beta Kappa, and the IEEE. He received the IEEE G-AC Paper Award for the best paper to appear in the 1964 IEEE transactions on Automatic Control, and the Eta Kappa Nu Distinguished Service Award from the Delta Omicron Chapter for his support as technical advisor for their message board project.

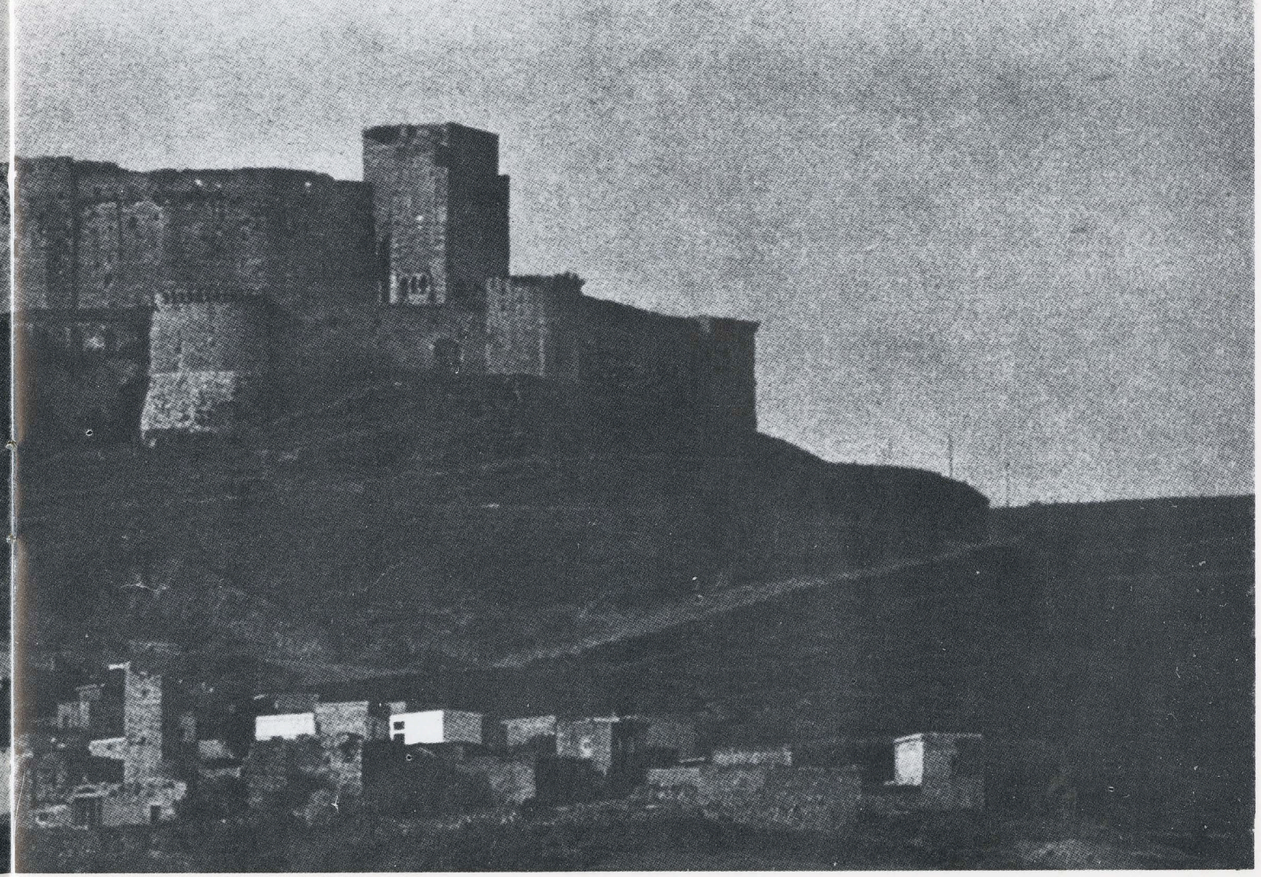
Zelby

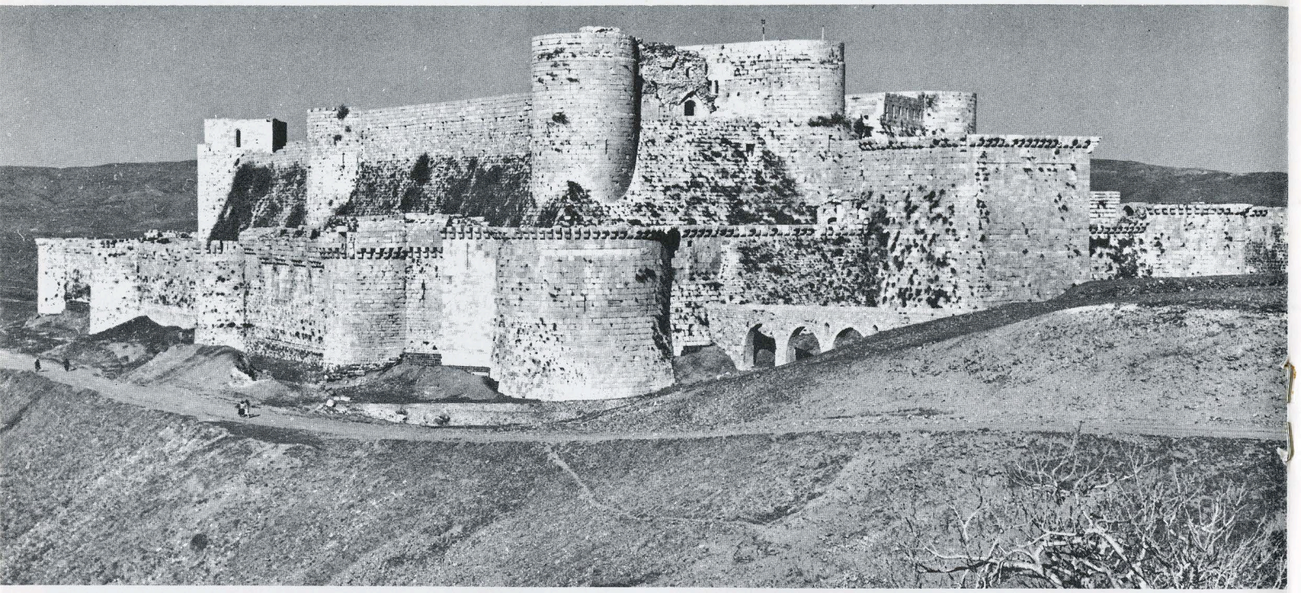
in the presence of the changes in technology? It will not do to blame technology for our ethical, or unethical, behavior. We cannot escape the responsibility for the failure to do one of two things: adjust technological changes to be consistent our ethical postulates, or adjust our ethics to changes in technology.

CASTLES of EUROPE

.... Part Two ....

Krak des Chevaliers





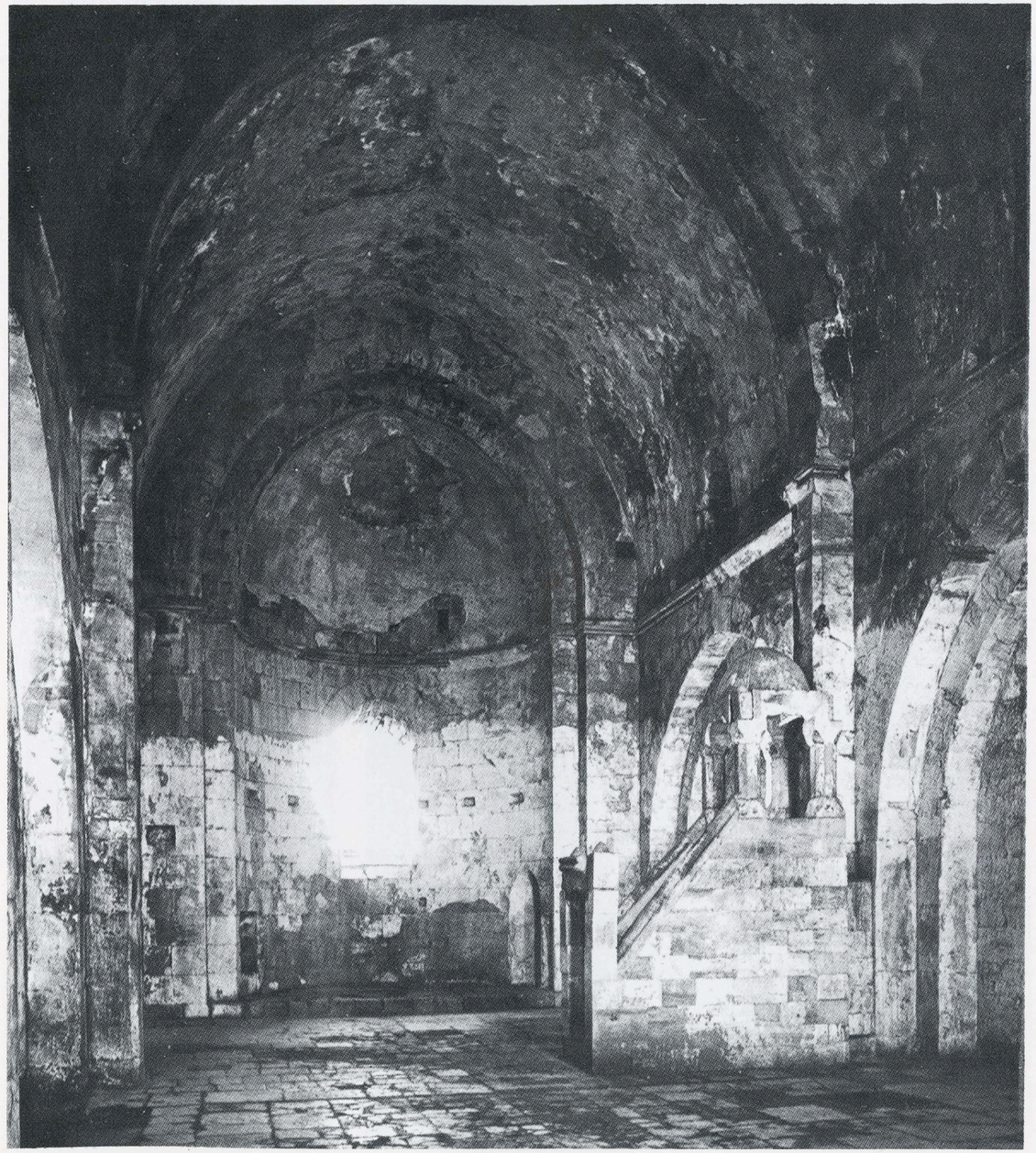
The mighty fortress of Krak des Chevaliers, the most important and impressive crusader castle in the Levant. This view shows the great talus or glacis of sloping masonry along the west and south walls. Opposite page — The chapel at Krak. Note the Muslim pulpit to the right, installed after the capture of Krak, when the chapel became a mosque.

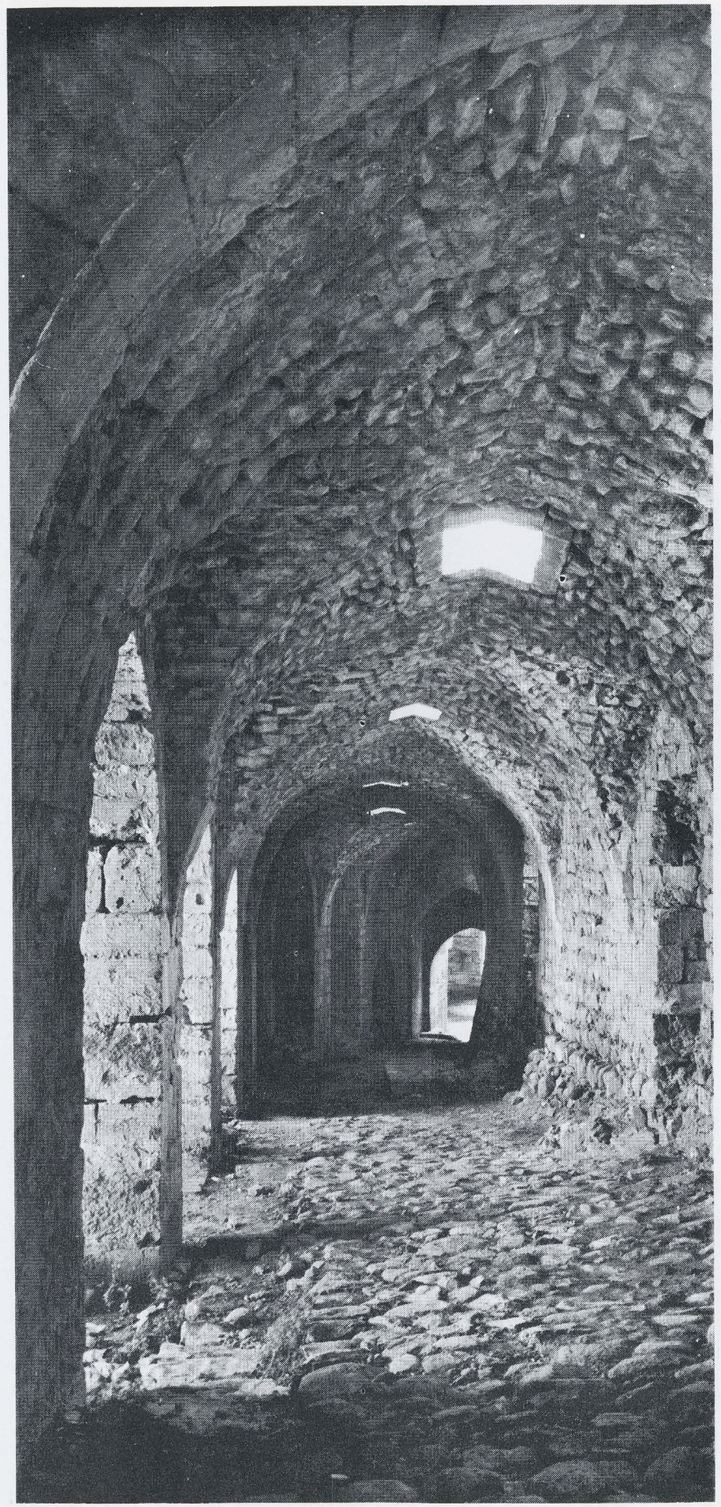
Krak des Chevaliers stands in the Syrian desert on a spur of black basalt rock between two converging wadis, or dried-up watercourses. On three sides the site is naturally defended by the lie of the land, which falls away sharply to the east, and rather less precipitously to the north and west. Strategically Krak was of great value as one of the castles controlling the Homs gap, the natural pass through the mountains between the main Syrian desert to the coast; it was also the main bastion guarding the road between the Muslim city of Homs and the Christian city of Tripoli. Until its fall in 1271, Krak was one of the most important crusader castles; certainly it is the most impressive both for its remarkable state of preservation and for the astonishing strength and complexity of its defences.

There was already a castle on the site of Krak when the first crusaders arrived in the 1090s. This castle, which was held by a Kurdish garrison — and for this reason was often referred to by Arab writers as the castle of the Kurds — passed into the hands of the Christian counts of Tripoli. But in 1142, Count Raymond II, who found the upkeep of the fortress too great a drain on his resources, sold the castle and its rich lands to the east to the Knights of the Hospital of St John of Jerusalem. And it was the Hospitallers who, over the next century, gave the castle its present shape.

The First Crusade reached its triumphant conclusion with the capture of Jerusalem in 1099 and the election of Godfrey of Bouillon as King of Jerusalem with the title of Defender of the Holy Sepulchre. During the following two centuries, the kingdom of Jerusalem and the other Latin states in the Levant were governed by feudal rulers whose political interests did not always coincide with the original purpose of the crusades. This was, in theory at least, to defend the holy places and to protect the pilgrim routes — a dual role that was increasingly assumed by the military religious orders of the Knights Templar and the Knights Hospitallers. The Hospitallers, the senior of the two orders, was founded in the 11th century to nurse sick pilgrims at the Hospital of St John in Jerusalem. It was still a nursing order when it was taken under papal protection in 1113, but from 1120 to 1160, during the grand mastership of Raymond du Puy, the Hospitallers became increasingly military in character, devoting themselves not only to the care of pilgrims on their arrival but also to their protection on their journey. With the Templars (founded in 1118), the Hospitallers represented a new element in the feudal structure of the Kingdom of Jerusalem — a military body answerable to the Church rather than to the king. Members of both orders took vows of poverty, chastity and obedience, and were pledged to draw their swords only in defence of the Cross against the Infidel. Yet though the knights themselves were poor, the corporate wealth of their orders grew enormously as pious patrons in Europe endowed them with valuable property. So as the power and resources of the secular rulers diminished during the 12th century, wealth and influence were accumulated by the orders, which gradually won control of the key points of the kingdom. From their headquarters in Jerusalem, and later from the castle of Margat, the Hospitallers administered vast tracts of land throughout the Levant.

The fortress at Krak is an outstanding example of the concentric plan, which played a vitally important part in the development of military archi-

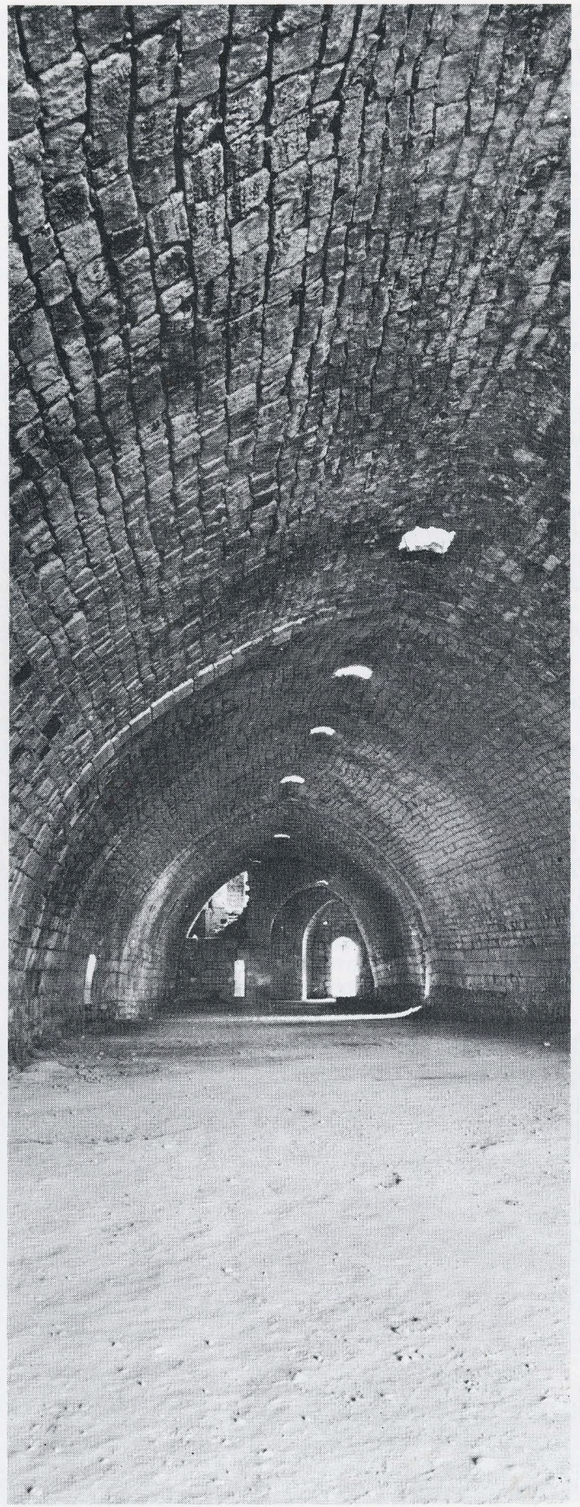




tecture. This form of castle was particularly favoured by the Hospitallers. Even so, we must not assume that Krak was originally designed as a concentric castle in the way that Château Gaillard, for example, was. The building of Krak, which was spread over nearly 150 years, was concentrated into two main periods; during the 1140s, immediately after the Hospitallers' take-over, and during the early 1200s, after an earthquake in 1202 had made major rebuilding and redesign necessary. During this second building phase, the 12th-century castle became, with the severe modifications that will be described later, the inner enceinte of the new one. In this second castle, the line of the inner wall, built according to the lie of the land around the top of the spur, followed the wall of the earlier structure; in fact, much of the original wall remains, concealed in the later masonry. The main entrance was by way of a gate in the east wall, approached by a zig-zag path up the steep escarpment on the east side. (So attackers attempting to breach the entrance either had to scramble up the steep and rocky slope or had to follow the winding path in column, crossing and recrossing the concentrated fire from the walls of the fortress.) The main work undertaken after 1202 was the massive additional defences to the west and south walls of the first enceinte, and the construction of a second outer enceinte, which, to the west, north and south, was built immediately below the existing walls. To the east, however, it ran down the steep escarpment to include part of the approach path, and was fortified to form the notorious ramp of Krak. Let us now take a more detailed look at these fortifications.

The interior of the ramp, leading from the main entrance. The attacking troups, once they had broken down the outer gate, had either to face the hostile fire from the inner wall or brave this sloping, vaulted passage with its 'murder' holes in the roof and unexpected sortie points for the defenders.

Obviously, the weakest part of the castle's defences was the wall to the south, where the gently sloping land broadened into the surrounding terrain. Consequently, a new line of masonry was built along the inner western and southern walls, and the earlier square towers were encased in rounded bastions, which deflected the weapons of the attacking forces more effectively and made mining more difficult. (Added protection was provided by the smooth finish of the stones, on which the besiegers were unable to attach their grappling irons.) In fact, mining these particular walls was made almost impossible by the massive *talus*, or masonry bulwark, which sloped outward from the walls and plunged some thirty feet down to the ditch between the enceintes. This *talus* extended along to the western and southern walls, while to the south was erected, as an additional precaution, the mightiest defence work in the whole repertoire of medieval fortifications. Here the ditch was excavated still deeper, and lined with stone to form a large *berquil*, or reservoir, which, besides supplying the garrison with water, confronted the attackers with a deep water-filled moat. The stone retaining wall of this moat rose steeply to join the inside of the outer enceinte and as shown on the plan, the whole complex was dominated by the three fortified towers. From the air, the full scope of the works can be seen at a glance, but from the ground, the obstacles are concealed by the wall of the outer defences. This element of surprise constitutes the final subtlety of the design, for even when the outer wall had been taken, the castle was still almost impregnable. In this way, the designers of Krak overcame the weakness of the site on the southern side and transformed it into the most formidable part of the building.



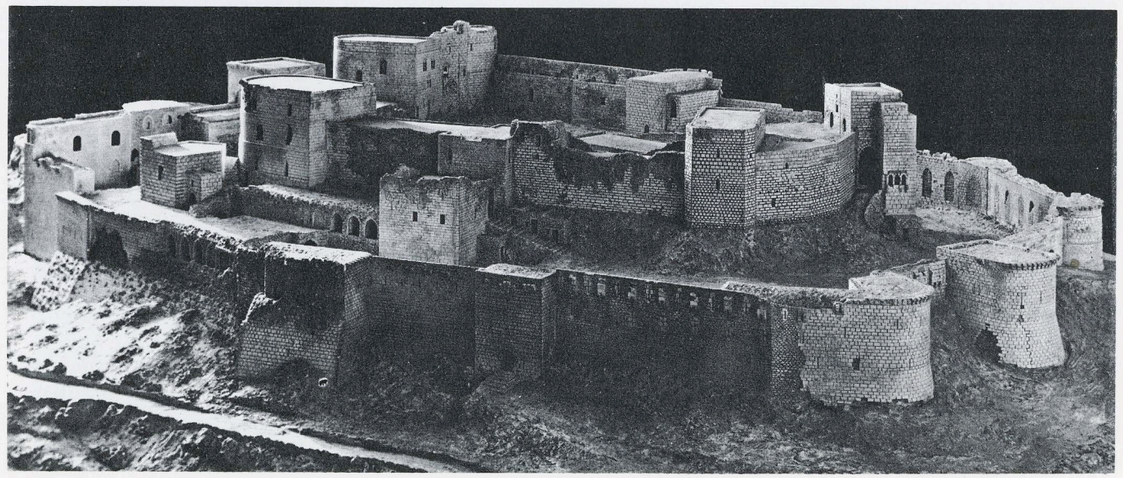
One of the great cellars at Krak. Here supplies would be stored and the soldiers of the garrison might also be quartered. Ventilation and light are provided by the holes in the roof.

To the east, the problem was different. As has already been pointed out, the lie of the land made this side of the site easy to defend; for this reason, it was here that the main entrance to the castle was situated. But because it is a major gap in the curtain wall, the main gate of any castle is always a weak spot. The designers therefore tried to divert the attackers' attention from the vulnerable entrance to the more easily defended sections of the walls. As might be expected, this aim was achieved at Krak in a particularly ingenious way. Judged by the rest of the building, the gate in the outer wall was not particularly formidable, but once it was breached, the attacker had to run the gauntlet of the first group of machicolations in the outer gate. He was then presented with a formidable choice: either he had to break out into the bailey between the two walls of defence and so expose himself to murderous crossfire or continue southward along the covered passage he had already entered. The vaulted passage, known as the great ramp, which followed the line of the zig-zag path referred to earlier, was defended by a series of machicolations, loopholes for archers, portcullises and concealed postern gates from which the defenders could spring out and take the terrified attackers unawares. And as well as all the other hazards, there was a hairpin bend to be negotiated. Following this dreadful route must have been a demoralising experience, and at the end of it, there was still the main gate of the castle to be taken.

Although the southern defences and the great ramp were undoubtedly the most heavily fortified points of the castle, all the defences were built with an equal degree of ingenuity and strength; in short, as far as humanly possible, Krak was proof against capture by storm. To have starved the garrison out would have been equally difficult. Like all great crusader castles, Krak was provided with vast storage space both for food and for water. We have already mentioned the great *berquil* — a word derived from *birke*, an Arabic word for a reservoir. Such reservoirs are found in other castles in Syria, an arid country where open and lined storage tanks were commonly used for storing rainfall. At Krak, the *berquil* (which in other fortresses was sometimes outside the fortifications), may well have been used as a welcome bathing pool for both men and horses; there were in addition as many as nine cisterns for drinking water. Inside the walls of the castle, massive vaulted undercrofts were used for storing grain and other foodstuffs. Perhaps the most impressive is the undercroft that runs from the north wall of the chapel around the inner perimeter of the inner enceinte — a distance of about 400 feet; almost equally imposing is the vaulted hall supporting the esplanade in the centre of the courtyard.

It has been estimated that, at full strength, the garrison of Krak would have consisted of about 2000 men. Whether Krak, or indeed any of the great crusader fortresses, ever contained its full complement is somewhat doubtful; certainly during its last years it was heavily undermanned. Even so, the wall towers, and possibly the undercrofts, could easily have accommodated the men-at-arms and mercenaries who made up the bulk of the defenders, while the knights themselves were most probably housed in the three great towers to the south. Of these, the south-west tower was almost certainly the castellan's residence; here the grand master of the order would have stayed during his visits to the castle. The tower's main chamber, entered from the wall-walk, is a handsome vaulted room with sculptured capitals and corbels and a large window

A model of Krak as seen from the north-east. The inner curtain wall contains the chapel and, round the corner, the north postern gate (see sketch on opposite page). The outer wall contains the main entrance (center) from which the ramp leads to the left.

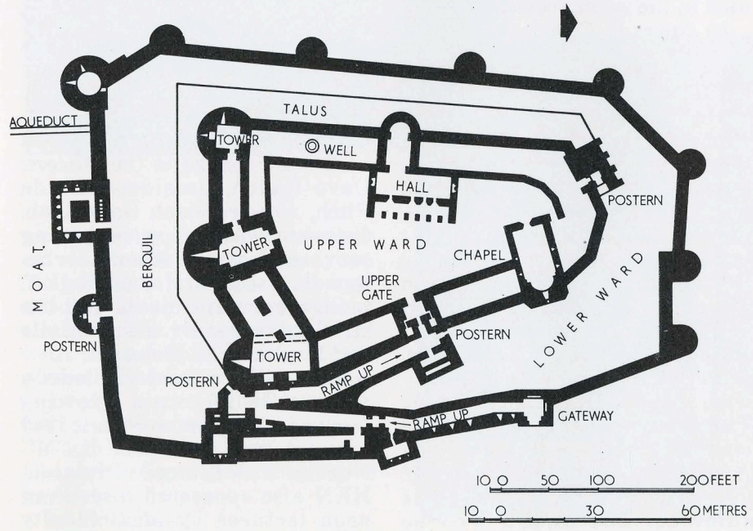


decorated with floral carving. The rooms in the other two towers are pleasant but less stately than the main apartments. It was once thought that the three towers were intended to be the castle's final line of defence by forming a kind of keep. But the English scholar Cathcart King has convincingly shown that the complex would not have presented a large attacking force with any very serious problems. While admitting that the arrangement of the staircases and the access to the various rooms — particularly to the main apartments in the south-west tower — suggest some form of defensive measures, King advances an interesting theory to account for them. He suggests that the precautions taken, although inadequate to repel a hostile army, would have deterred an attempted mutiny by the mercenary garrison against the knights and the castellan.

In peacetime the chapel was the centre of life at Krak, and, as might be expected in a castle inhabited by a religious order, it is a large and elaborate building. It was constructed during the 1170s, after an earthquake had destroyed the earlier structure. Built in the Romanesque style, it measures about 65 feet by 25; at the east end the chevet projects a few feet through the curtain wall to form a defensive tower. A century later, the knights built an impressive banqueting hall by the north wall of the inner enceinte. Along the outside of the hall is a cloister gallery, notable for the elegant carving of its window mullions, capitals and corbels. To help maintain the garrison, the castle was also provided with a windmill on its walls and an aqueduct running into the *berquil* through the south wall.

As well as being a castle built to withstand siege, Krak was the residence of knights belonging to one of Christendom's most powerful orders, whose pennant flew proudly from the castellan's turret. It was therefore provided with living quarters suitable for men of rank. It was a centre of the strange life led by Christians in Outremer, the land beyond the sea — an existence of continual compromise with the infidel. Thus the king of Jerusalem held audience cross-legged in the Arab manner; proud scions of great Frankish families dressed in soft, flowing Oriental garments and counted Arab scholars among their friends and courtiers; and Christian knights became learned in the scriptures of Islam. In the courts of Outremer, a witness might swear on the Koran, and the accused could be convicted only on the testimony of a co-religionist. Not surprisingly, the knights of the religious orders were less inclined to fraternise with the civilisation that they were pledged to fight; but they too, in times of peace, were obliged to come to terms with the infidel subjects who surrounded their strongholds and cultivated their land. It has been calculated that the total number of Western knights in Outremer never exceeded 3000; a policy of live and let-live was therefore inevitable.

A sketch plan of Krak.



But peaceful co-existence is no substitute for military strength. During the 13th century, as the powers of Europe turned more and more to their own affairs, the Latin states of Outremer became increasingly exposed to attack by their Muslim opponents once a leader had arisen to reunite them. This leadership was provided by the Sultan Baybars (the name means a panther), a Mongol by birth who was sold into slavery first as a youth in Damascus and later to the Egyptian Mameluke Sultan Kotouz. He rose rapidly in the service of Kotouz and in 1260 assassinated his master, proclaiming himself sultan. To his political ruthlessness and military skill, Baybars added a fanatical hatred of Christianity. The Latin states were powerless to check his growing power, and after the failure in 1270 of the Eighth Crusade, no further reinforcements arrived from the West.

In March the following year the conquering Baybars stood before the forbidding walls of Krak, which during its long history had withstood twelve sieges and from whose gates even the great Saladin had turned away. But the sultan was determined on capture, and the garrison, although well able to hold out for a year or more, must have realised that there was little or no chance of relief.

There are three Arab descriptions of the siege; one by a contemporary writer who reached the victorious army three weeks after it had taken the great fortress

and two by authors writing a century after the event. From these records it seems that the siege began from the south on the morning of March 3, 1271. The little town outside the castle walls was quickly overrun, but heavy rains held up further attack for nearly three weeks. Then the outwork on the triangular plateau beyond the south wall of the fortress was easily taken. At this point the siege began in earnest, and after heavy mining, the great south-west tower of the outer enceinte collapsed and the attackers rushed in to find themselves confronted with the huge and impenetrable inner defences. These, however, were not put to the test, for the sultan resorted to trickery. Perhaps by means of a carrier pigeon, he sent a forged letter into the castle, apparently from the grand master of the Hospitallers, ordering the defenders to surrender since no help could be sent to them. This order was obeyed by the castellan, either because he thought the letter was genuine, or because it afforded an honourable excuse for abandoning a hopeless struggle. After the castle's surrender, the garrison was allowed to evacuate the fortress with their possessions.

After his great victory, the sultan is reputed to have sent another letter, this time addressed to the grand master of the order himself. In it he is supposed to have said (among other things): 'May the Lord include thee amongst the number of those who do not struggle against their destiny, but who fear to offer resistance to the master of victory. We announce to thee what God has done for us.' What God had in fact done was to open the last defences of Outremer to Islam.

BETA RHO CHAPTER, West Virginia University — In the fall semester the Beta Rho Chapter sold tickets for a raffle as a fundraiser. The chapter initiated 14 members, who were recognized at the fall banquet. John Harshburger shared his experiences in starting a private business in Xenia, Ohio: Visual Information Institute, Inc., which designs test equipment for closed circuit TV.

The chapter began the spring semester with a variety of projects. A committee planned and set up an Electrical Engineering display at the Mountainlair, the student union building, during Engineering Week. Another committee created a resume book for the Electrical Engineering Department to accommodate sophomores, juniors, and seniors. Resumes were sold to a number of companies for a good profit. This project is expected to be an annual project with greater success in the future, as more students participate. A third committee was given electrical measuring devices dating from the 1880's to the mid 1900's, to put in a display case, built by the committee, on the main Electrical Engineering floor of the Engineering Sciences Building. Members were assigned to research the history of a couple devices, which would be included in the display case.

The officers elected at the next meeting for the fall of 1980 were: President, Mike Poplarchik, Vice-President, Janie West; Corresponding Secretary, Dave Willis; BRIDGE Correspondent, Michael Kelly; Recording Secretary, Roger Hill; Treasurer, Brian Carpenter. Also, 9 new members were initiated in the spring semester.

by James R. Feyrer

THETA ALPHA CHAPTER, Tulane University — Theta Alpha Chapter had a traditional induction ceremony at Dr. Daniel Vliet's home on Wednesday 23 April 1980 followed by refreshments. The EE Department banquet was held at the Saxony Restaurant in New Orleans on Thursday 24 April 1980. IEEE and HKN officers were recognized, as were new HKN members. John Boquet, HKN President, announced that HKN, IEEE and the Tulane EE Department have established the James A. Cronvich Award in honor of Professor Cronvich who is retiring this summer. The award will be presented to an electrical engineering student of Prof. Cronvich's choice at the Tulane Engineering School's Annual Awards Banquet.

Other HKN activities included tutoring sophomore EE's and non-EE's in circuits courses, and EE's in other select courses.

by John Boquet

OMICRON CHAPTER, University of Minnesota — To help celebrate the Diamond Jubilee of Eta Kappa Nu a special Fall 1979 initiation banquet was planned and prepared by the officers and advisors of Omicron Chapter. Over 20 initiates along with old members and EE faculty brought the total attendance at the banquet to 68. After our hefty feast we were honored to have guest speaker Dr. Otto Schmitt relate to us some of his college experiences. Dr. Schmitt, who does his research work at the University of Minnesota, is well known for his work in the biomedical field. He is probably best known for his invention of the "Schmitt Trigger" which was originally designed to simulate nerve reactions.

On November 28, 1979 the second annual EE Career Fair was held. Over 25 local engineering companies attended this fair (see pictures) sponsored by the EE department, IEEE, and HKN. The fair was very successful in providing the engineering students with a chance to look at the products, services, and types of jobs available in the Twin Cities area. The local companies were also given the chance to do a little recruiting themselves!

The 79-80 school year got off to a good start thanks to the officers: Dave Rauch, president; Linda Fitch, vice-president; Gary Koob, treasurer; Alex Toy, recording secretary; Brian Maus, corresponding secretary; Paul Rolloff, bridge correspondent; and the HKN advisors: Dr. James Holte and Dr. Narenda Mohan.

Other HKN activities included a tour of the Olympia Brewing Company facilities on Feb. 1, 1980 followed by a later tour of FMC Northern Ordinance Division. HKN also sponsored a series of noon lectures by local faculty members on their current research work in the areas of Tomography, Magnetic Bubbles & Recording, and Application of Lasers. Guest speakers from Honeywell Corporation and McConnell Douglas were also sponsored by Omicron Chapter.

Besides the usual EE student tutoring services provided by HKN the annual "Senior Technical Electives Seminar" was organized and carried through to help this years juniors decide what technical electives to take their last year.

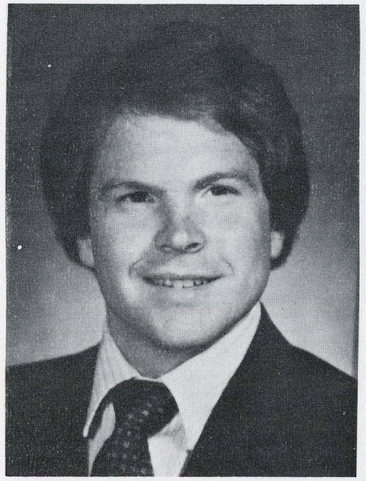
Spring initiation followed quickly along with new officer elections. The year was topped off with the annual "Spring Fling" where EE faculty and students enjoyed a picnic full of baseball, food and even door prizes.

Good luck to the 80-81 Omicron Chapter in hopes of another active and successful year.

by Paul Rollott

OMICRON CHAPTER — UNIVERSITY OF MINNESOTA. Above — chow-down at the initiation banquet. Left — Chapter member and Control Data Co. Engineer discuss the state of the art at the Career Fair. Below — An overview of the Career Fair sponsored by the chapter.

Student Award Winners



MARK DAVID VANSTRUM
WINNER 1980

THE
ALTON B. ZERBY
OUTSTANDING ELECTRICAL
ENGINEERING STUDENT
AWARD

Wins expense-paid trip to Disneyland for an Award Dinner in his honor and a gift of $500.00 from the Carl T. Koerner Memorial Trust.

MARK DAVID VANSTRUM with a G.P.A. of 4.00 was nominated by Xi Chapter at Auburn University at Auburn, Alabama. He was honored with membership in Eta Kappa Nu, Tau Beta Pi, Phi Eta Sigma, Pi Gamma Tau and served as Vice-President of the student chapter of IEEE.

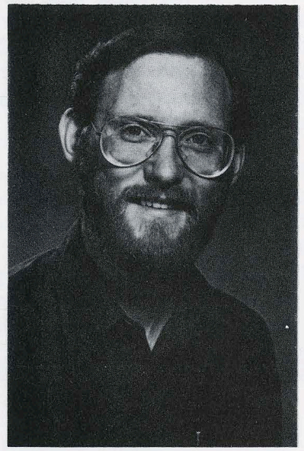
Mr. Vanstrum gave freely of his service within the Electrical Engineering Department at Auburn mostly through the projects of Eta Kappa Nu and Tau Beta Pi. His Eta Kappa Nu service was responsible, in part, for Xi Chapter being named Outstanding Chapter for the Year 1978-79. His service included tutoring, Red Cross service and Engineering-Day display organization. He taught undergraduate students in Computer Organization and Assembly Language Programming.

Mr. Vanstrum assisted Dr. S. A. Starks with the paper "An Optimal Linear Map for Pattern Recognition", which was presented at the Alabama Academy of Sciences in April, 1980. He received the Phi Kappa Phi Outstanding Freshman and Sophomore Award, the Fred H. Pumphrey Outstanding Pre-Engineer Award and the Fall 1979 Outstanding Graduate School of Engineering Award. He worked for the USDA National Tillage Machinery Lab in Computer Programming and as a co-op student with South Central Bell.

For relaxation he enjoyes working with audio equipment and playing tennis, racquetball and basketball. He is an accomplished musician on piano and guitar.

Text by
Colleen and
Larry Hamilton

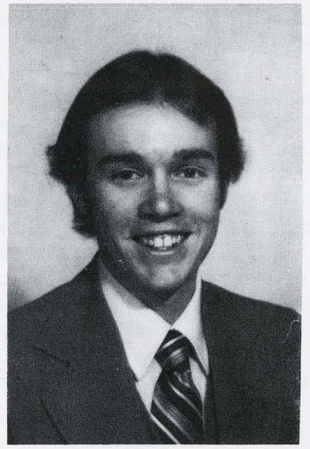
HONORABLE MENTIONS



LYN BOWMAN with a G.P.A. of 3.88 was nominated by Epsilon Tau Chapter at the University of California at Santa Barbara. He was honored with membership in Eta Kappa Nu, Tau Beta Sigma and is a member of the IEEE. He served as Vice-President of the Tau Beta Sigma. Mr. Bowman organized the Eta Kappa Nu undergraduate Seminar series which provided an outstanding speaker once each week throughout the school year for 1978-1979. Mr. Bowman authored the following publications: "Introduction to Gas-Liquid Chromatography" and "Rules for the Use of Qualified Delay Lines in TTL Networks." He also invented an Underwater Scale and Percent Body Fat Microcomputer.

He was hired by the Gestalt Institute of Canada to form, manage and lead a psychotherapeutic program for young people between the ages of sixteen and thirty. Mr. Bowman worked as a masseur for the Arne Stig Therapy Center to massage up to 50 patients per week by prescription for orthopedic surgeons and neurologists.

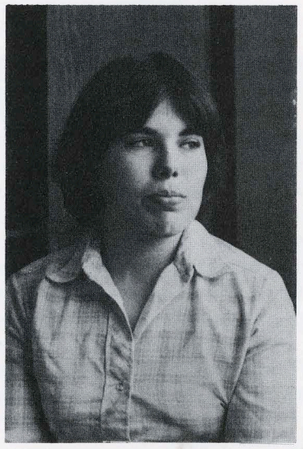
For relaxation he enjoys weight lifting.



ROBERT STANLEY HOWARD with a G.P.A. of 3.96 was nominated by Zeta Theta at California State Polytechnic University at Pomona. He was honored with membership in Eta Kappa Nu, Tau Beta Pi, Phi Kappa Phi and Kappa Mu Epsilon. He was Recording Secretary for both Eta Kappa Nu and Tau Beta Pi. As an officer of Eta Kappa Nu, he helped organize a program of guest speakers. Mr. Howard was Treasurer of the Interhall Council with an annual budget of $30,000. He was Recording Secretary for Cedritos Hall.

He worked at General Dynamics on digital circuits with microprocessor and other LSI applications, including design, documentation and hardware checkout. He was responsible for the design of two information cards. Mr. Howard was a campaign worker for an Assemblyman during the past two general elections.

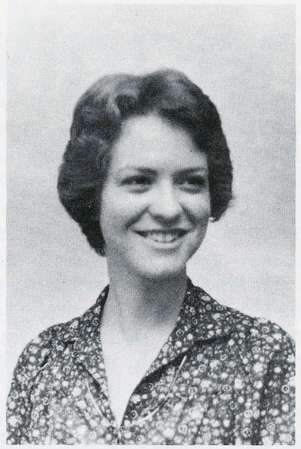
For relaxation he enjoys photography, snow skiing, softball and hiking.



CHERYL VIRGINIA LISS with a G.P.A. of 3.76 was nominated by Gamma Xi at the University of Maryland. She was honored with membership in Eta Kappa Nu, Tau Beta Pi, Sigma Xi, Mortar Board, Phi Kappa Phi and was a member of the student chapter of the IEEE. She served as a tutor for both Tau Beta Pi and Eta Kappa Nu, and also served as Recording Secretary for Eta Kappa Nu. During her term as President of Eta Kappa Nu she improved the procedures of operation and member's participation. She also served as President of the Mortar Board. Miss Liss won the Society of Women Engineers/RCA Scholarship for 1978 and 1979, and was awarded the Eta Kappa Nu, Gamma Xi Chapter Outstanding Senior Award for 1980.

Miss Liss worked as a Technical Intern, Nuclear Regulatory Commission, Power Systems branch to help pay for her education. She authored a term paper "A Survey of Analog to Digital Conversion Techniques".

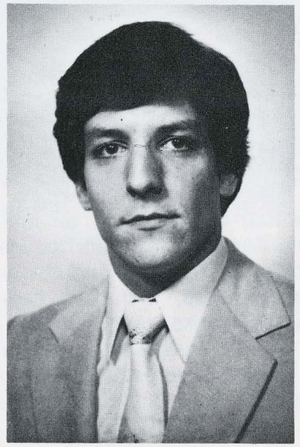
For relaxation she enjoys, amateur radio, riflery, camping, swimming and electronics.



CINDA ANN STIPE with a G.P.A. of 3.93 was nominated by Delta Iota Chapter at Louisiana State University. She was honored with membership in Eta Kappa Nu, Tau Beta, Phi Kappa Phi and is a member of the IEEE and the Society of Women Engineers. She served as Chairman of the Tutoring Committee for Eta Kappa Nu and was elected President of Delta Iota Chapter. Miss Stipe worked with her sorority to raise money for the National Association for Retarded Children and to help children from the Baton Rouge School for the deaf.

She won the LSU Alumni Federation Top 100 Scholarship, The Shell Scholarship for Outstanding Women in Engineering and was nominated for LSU Outstanding Active Award. She is the author of the following publications:"Report on the Dynamic Properties of Orthotic Materials", "Design of a Graphic Input Mouse" for The Mechanical Engineering Department and designed and constructed a mircoprocessor-controlled analog system.

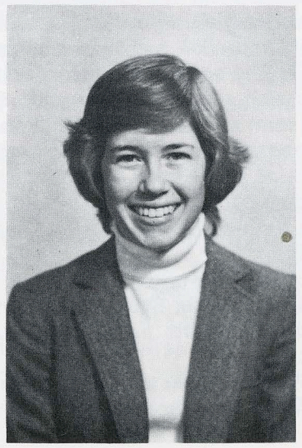
For relaxation she enjoys playing the piano and the guitar, water skiing and backpacking.



GREGORY THOMAS WARHOLA with a G.P.A. of 3.94 was nominated by Gamma Sigma Chapter at the University of Utah. He was honored with membership in Eta Kappa Nu, Tau Beta Pi, Phi Kappa Phi and was a member of the student chapter of the IEEE. He has served as Corresponding Secretary for Eta Kappa Nu. Due to the close association he has developed with the faculty and staff of the Electrical Engineering Department he was able to influence Air Force decisions to educate more of its personnel at his university.

He authored the following papers: "Oscillation Characteristics of Active Almost Periodic Structures" and "Filter Characteristics of Imperfect Periodic Structures", presented at the North American Radio Science and IEEE/AP-S International Symposium, June 1980. To help pay for his education he was a teaching assistant, a discussion section leader, a laboratory instructor and a grader.

For relaxation he enjoys playing racquetball and baseball and playing jazz and classical trumpet.



JANICE HAYNES WORLEY with a G.P.A. of 4.00 was nominated by Beta Phi at the University of Tennessee. She was honored with membership in Eta Kappa nu, Tau Beta Pi and Phi Kappa Phi and is a member of the IEEE and Society of Women Engineers. She has served as Bridge Correspondent for Eta Kappa Nu and did much of the organization work for the honors banquet. She was Chairman of the IEEE Section and did an outstanding job with the section which is the second largest in the United States. Through the IEEE she organized a weekly luncheon program for electrical engineering students and staff and recruited speakers. Miss Worley won the Phi Kappa Phi Outstanding Senior Award and the Schlumberger Foundation Undergraduate Award.

She acted as a big sister to underprivileged children. Miss Worley designed a digital data monitoring system for a tractor and has served as Secretary on the ACE board.

For relaxation she enjoys hiking, backpacking, biking and playing basketball.

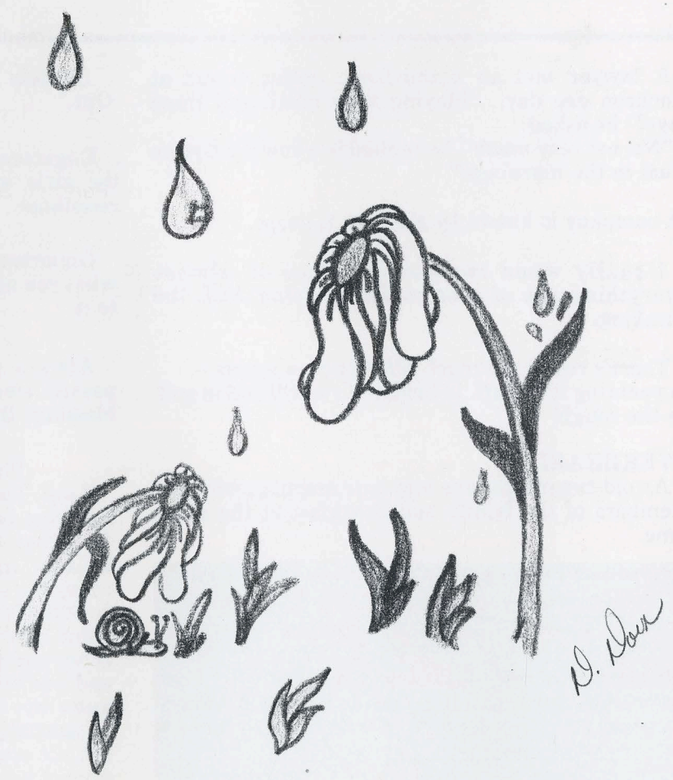
June

Poetry by J.R.Lowell **Art by Debbie Dorn**

What is so rare as a day in
June?
Then if ever, come perfect days;
When Heaven tries earth if it be
in tune,
And over it softly her warm ear
lays;
Whether we look, or whether we
listen,
We hear life murmur, or see it
glisten.

The cowslip startles in meadows
green,
The buttercup catches the sun
in its chalice,
And there's never a leaf nor a
blade too mean
To be some happy creature's
palace;

The little bird sits at his door in
the sun,
Atilt like a blossom among the
leaves,
And lets his illumined being
o'errun
With the deluge of summer it
receives;
His mate feels the eggs beneath
her wings,
And the heart in her dumb
breast flutters and sings;
He sings to the wide world, and
she to her nest,
In the nice ear of Nature which
song is the best?



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MERRY MOMENTS WITH MARCIA

A lawyer met an enthusiastic golfer friend at luncheon one day. "Playing very much golf these days?" he asked.

"No, not very much", he replied in a downcast voice "Just in the mornings!"

A company is known by the men it keeps.

Usually when two people agree on almost everything one of them must be doing ALL the thinking.

There's really not much difference in sports—
In yachting it's a luff, in bridge it's a ruff and in golf its the rough!

OVERHEARD:
An old-timer is the one who can remember when all members of the family had breakfast at the same time.

Shapely limbs have helped many a girl to "Branch Out."

Engineers are often baffled by the fact that some of the girls with streamlined figures offer the most resistance.

Opportunist: a person who goes ahead and does what you always wanted to do, but didn't get around to it.

Always remember to forget the troubles that passed away, but never forget to remember the blessings that come each day!

PRAYER FOR **OLDER** PEOPLE

Lord, Thou knowest that I am growing older. Keep me from becoming talkative and possessed with the idea that I must express myself on every subject. Release me from the craving to straighten out everyone's affairs. Keep my mind free from the recital of endless detail. Give me wings to get to the point. Seal my lips when I am inclined to tell of my aches and pains. They are increasing with the years and my love to speak of them grows sweeter as time goes by. Teach me the glorious lesson that occasionally I may be wrong. Make me thoughtful but not *nosey* — helpful but not bossy. With my vast store of wisdom and experience it does seem a pity not to use it all. But Thou knowest, Lord, that I want a few friends at the end.

by MARCIA PETERMAN