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This article outlines the evolution of an engineer from recent graduate to senior scientist or top-level supervisor, describes the problems he encounters at various stages of his career, and gives some guidelines to growth opportunities. In learning how to help his employees, a supervisor grows and improves his own abilities. Self-evaluation is a vital part of the growth process, yet an individual is a poor judge of his own strengths and weaknesses; hence the role of counselor, be he supervisor, trusted friend, or sought out professional, is important at all stages in the personal growth of every engineer.

the ENGINEER as an INDIVIDUAL

Each engineer is a unique individual. His supervisors must recognize this or risk failure as managers. Thus, programs for developing supervisory personnel at research and development laboratories like APL should avoid two extreme, yet commonly held, attitudes: One extreme says that getting the job done is all that's really important. With this "carrot-and-the-stick" attitude, managers study psychology to see how to coax, cajole, trick, or, if necessary, threaten people so that the job gets done. The other extreme says that keeping workers happy is all that's really important. With this "Pollyanna" attitude, deadlines, pressures, and tensions are viewed as undesirable intrusions on the individual's freedom and serenity.

Rather than following one of these extremes, our approach is grounded on common sense. Our approach is to see the man and his task going hand in hand. The man is assisted to grow into his task; the task, in turn, helps the man grow. If the task is emphasized without personal consideration for the man doing it, the job situation becomes inhumane, and the work eventually shows it. If, on the other hand, a man's feelings are given *exclusive* priority, he becomes soft and incapable of growth, and once again, his work shows it.

If you are a supervisor or think you'd like to be one, this article should interest you. The first section introduces basic concepts of critical importance to the practice of management. It deals with the individual and his society, his need for identity and growth, for formation and guidance. The second section describes the various stages in an engineer's career; it deals with the attitudes, motivations, and difficulties he confronts at each

of these stages. The final section explores some of the key elements of the supervisory relationship.

Concepts

IDENTITY—A young engineer is often amazed at his boss's dismay when he announces his acceptance of a position with another company. Because the young man had had only casual and impersonal contact with his boss, he had no reason to think he was important to the firm. In fact, he had almost convinced himself that his departure would be welcomed. Every person, regardless of his level of employment, needs to feel useful, needed, and wanted. Each organization, on the other hand, must control its own destiny and evaluate its own staff. It must do its best to keep its productive, creative staff members and to release its ineffective ones.

Identity is less a feeling than it is an understanding—a person's conscious awareness of where he stands. Everyone should know who he is and what he can accomplish. The social ferment of our times goes beyond the poverty-riches, urban-suburban, opportunity-impotence tensions common in our headlines; human dignity is striving to overcome society's indifference to individuality. No human being can be content if he feels that the sum total of his individuality is a few holes in an IBM card, a social security number, and a signature on a check.

CHANGE—Change permeates our environment. We can fashion successful lives only if we understand how to change ourselves and act on that understanding. Many come to management development programs only to balk when they see that they must change if they are to improve. Yet change they must. As a publication of the Harvard Graduate School of Business Administration says,

Cartoons by APL staff artist Wesley Eckholm.

"constant change has become a condition of life and business . . . The concept of . . . development and renewal through education has evolved from an innovation of the Fifties to an imperative of the Sixties."

Sometimes change is difficult to notice; at other times, it is painfully obvious. A person does not stop growing or changing when he leaves adolescence or when he completes his formal education. Failure to recognize the need for continuing education, personal assessment, and personal change can result in both career and family difficulties. Education involves more than the accumulation of facts. For someone aspiring to a supervisory position, it involves a realignment of attitudes, a shifting of viewpoint to match and cope with changes in his environment, his colleagues, and especially himself.

GROWTH—One aspect of this change is personal growth; that is, an intelligent, orderly change for the better that results in an improved understanding of the self and its physical and social environment, and in a strengthening of the abilities required to do a job. Many television spectators who watched the Winter Olympics from Grenoble, France, this year saw Jean Claude Killy receive gold medals for winning the downhill slalom and giant slalom races. The exuberance of his elation expressed perfectly the acute joy of



ADAPT TO CHANGE

receiving a personal reward for a signal achievement. Even the most casual viewer could sense the intensity of his happiness, made all the greater by the work he put into winning.

The young engineer experiences a similar satisfaction when he attains his degree and accepts a position with an organization that fulfills his personal expectations. Both the skier and the engineer experience and, with a little reflection, fully understand what is involved in personal growth. They have been disciplined in the rigors of their professions; they have felt personal satisfaction when those periods of intensive work have produced tangible success. Between successes, they, like everyone else, may find a pressing, though subtle, need to think through and understand personal growth. At such times, each individual tends to inventory his goals and expectations: What am I doing? Why am I doing it? Who am I? Where am I going? Quality control is as necessary for one's personal life as it is for the product of his work.

FORMATION—Each of us must formulate a growth plan that has as its goal the cultivation of habits that enable us to work more productively and deal with others more effectively. Once this plan is established, we must use it consistently to mold ourselves into a new form. Knowledge of self and guidance by others (supervisors and mature friends) are indispensable components of this formation.

The following traits are *essential* to high performance: high interest, striving for perfection, willingness to listen to others, seeking others to learn from (through education, experience, and personal exchange), trying to understand and apply what is learned, effort, evaluation of one's progress, beginning again, sacrifice, making best use of talents, overcoming and improving upon personal limitations and defects. Through a recycling of these elements by means of deliberate effort, the individual can prepare to seek higher goals and accept greater personal responsibility.

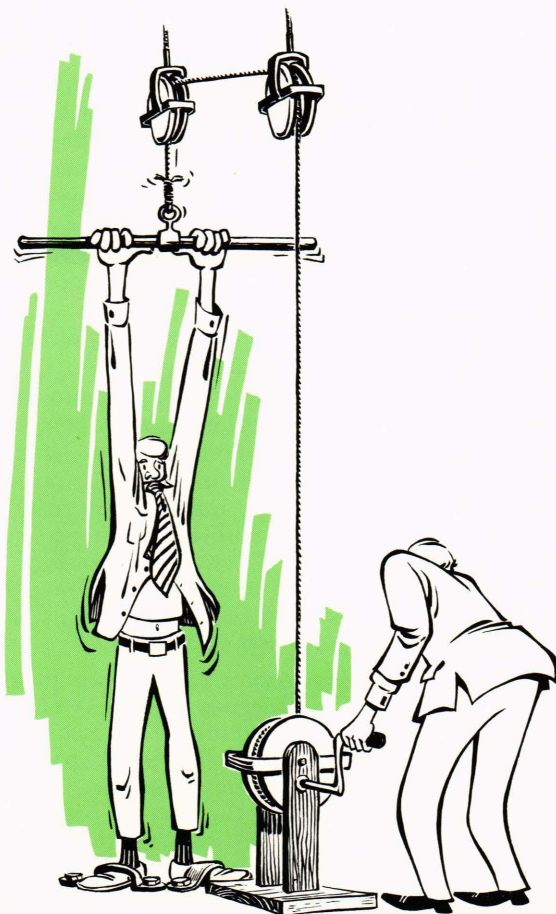
GUIDANCE—We are usually rather poor judges of ourselves. Yet, an objective appraisal of our talents, situation, needs, and abilities is indispensable before we can begin to make the most of ourselves. Hence, the need for guidance.

While people are riding the crest of the wave of success, they rarely see any need for self-evaluation, self-understanding, or for establishing a direction in their lives. These needs are more readily recognized when success wanes and when patience and perseverance are required. In such periods, it is particularly important for a person to have someone close at hand with whom he can speak frankly, exchange ideas, and, in so doing, regain his perspective.

If the skier wishes to improve, he must continue trying, listen to his coach, understand what is

being said, and apply it. The more we listen to others, learn from them, and apply what we learn to our own lives, the more personal return we receive. Therefore, we can promote our personal growth by trying to listen, by trying to understand, and then by simply trying.

COMPOSITE—Put these concepts together, and they paint a picture of the engineer as an individual. He is a man seeking to find himself in a complex and changing society. He aspires to a position of leadership in his field, but he finds the path beset with boulders that do not yield to his engineering skills. At length, he realizes that he must see his environment as social as well as physical, that he must understand himself and other people, and that he must try to form himself into a new person through a planned program of personal growth if he is to achieve his goals.



PROMOTE YOUR EMPLOYEES' GROWTH

Career Stages

One of the key elements in understanding others in an R&D laboratory like APL is recognition of the five basic stages of an engineer's professional

life. Awareness of these stages and the characteristics that accompany them is necessary for successful leadership. Often a 40-year-old senior engineer needs to explain a specific approach to a problem to a 22-year-old engineer. In this situation, an understanding by the older man of the younger one's perspectives, drives, attitudes, and conditioning can ease communication between them and can therefore solve the problem better and faster. In other situations, a younger man's awareness of the attitudes and approaches of an older engineer will be equally helpful.

In what follows, the stages of professional life are arbitrarily and incompletely defined. The age ranges are selected on the basis of the author's personal experience with APL engineering and scientific personnel. Since many of the distinctions between stages are more of degree than kind, they may be overdrawn in some instances in the interest of clarity.

Stage One: The YOUNG Engineer (20-27 years of age)—technical education excellent, displays ample confidence, committed, little experience, only vague idea of a specific professional interest, few organizational or family responsibilities.

Stage Two: The Senior Engineer (28-35)—supervisor or specialist, some updating of education, experienced, high interest in a specific area of his professional field, promotable, increased responsibilities and obligations, family man.

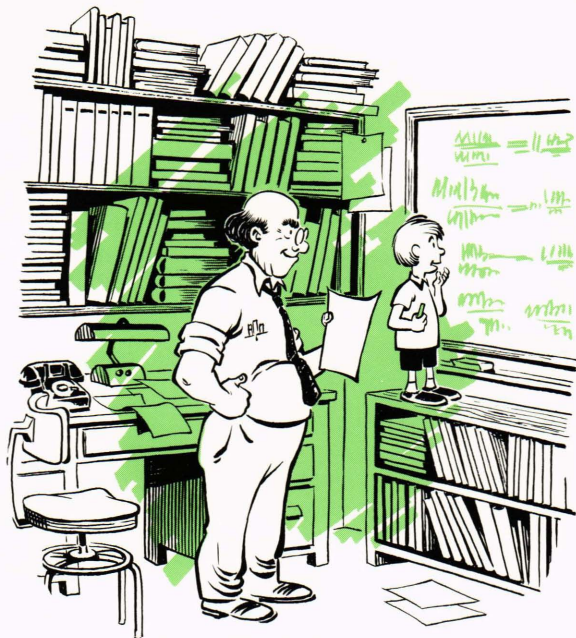
Stage Three: Key-Level Man (36-43)—peaking in speciality, increased supervisory responsibility, assigned as manager, technical director, systems engineer, coordinator, or specialist.

Stage Four: Life begins at 40 (44-51)—expert, education may be out of date, shifting assignments, obligations and responsibilities, physical limitations.

Stage Five: Age of Wisdom (52-up)—consultant or manager, a new approach to an old assignment or a new field of interest, others seek advice.

These are the major professional growth steps that are recognizable in a research and development activity. At all stages, each individual needs understanding, interest, and respect from others. The techniques for growth also remain constant—striving for perfection, appropriate guidance from qualified persons, and a giving of one's self through example, as well as by directing, advising, correcting, and encouraging others. At every stage engineers have problems in common, such as the need to maintain interest in their jobs, the need to feel useful and contributing, and the desire to enhance their positions. Then there are these special problems more characteristic of each stage:

THE YOUNG ENGINEER (20-27)—If he has no family, the young engineer's problems are related primarily to his profession; otherwise, they are divided between family and profession. He has been trained for 20 years to expect guidance and



UNDERSTAND YOUR COLLEAGUE

assistance from others when he needs it. He has a fine education, a commitment to continue learning, and an optimism and enthusiasm that will carry him along for some time. His prime concern is to be assigned problems that will give him the opportunity to show his professional skill. He wants to be useful and productive, but he also wants assignments which will develop his skills and will result in recognition from his superiors and peers.

This recognition is important to him, but its lack will not necessarily create anxiety if it is not forthcoming immediately. Serious doubts can begin to occur, however, if he begins to feel that his work is not satisfactory. This situation is seriously complicated if he cannot find out what his supervisors think of his work. If this feeling grows unabated, and if he starts comparing himself with others (on the basis of subjective opinion rather than fact), he may soon come to feel that he does not "belong." If his supervisor does not give him adequate attention or fails to recognize his contributions, he may feel that his talents are being wasted.

In other spheres, his personal or religious identity and his acceptance of family and financial responsibility may also be posing difficult personal problems. In these areas, he often seeks out a friend for counsel and guidance. Too often, unfortunately, this person is not as informed and mature a person as the situation requires.

THE SENIOR ENGINEER (28-35)—The senior engineer has made significant professional contributions and has something to show for it. He is

respected by his colleagues, his supervisors, and the supporting personnel. He is growing fast; success follows success. His confidence increases. He works hard and is highly productive. He spends the major portion of time on the job. He receives more and more interesting assignments requiring more time and effort. His supervisory and management experience is very closely related to his technical assignment. Selecting assignments and allotting time become extremely important. Intense interest in his job and the high level of professional demands force neglect of his other responsibilities—family, social, civic, and religious. This unbalance creates frustrations in his nonprofessional life that carry over into his professional work. Subjectivity, political considerations, some overconfidence regarding his worth and a diminished confidence in the worth of his boss, can combine to cause anxieties that tend to decrease productivity. He may be troubled simply by a vague uneasiness, or by a conscious loss of blind faith in top management, or by some difficult and persistent human relations problem. Thus, the idea that better opportunities exist elsewhere can gradually gain ground.

THE KEY-LEVEL MAN (36-43)—The key man has many intricate responsibilities. Crucial on-the-spot decisions are required of him, often in areas where he questions his own ability to judge and to make adequate decisions. He places more dependence on the staff personnel. He comes in contact with what seems to be a new language (management and policy terminologies). His family, especially his children, require more of his attention and, if family-profession unbalance exists, it now causes him acute unrest, frustration, and anxiety. He cannot spend enough time with the young engineers and cannot keep up with the new technical developments in his field. The constant pressure of too little time, his own physical limitations, and vague questions regarding his future growth cause him further uneasiness. Can I still obtain employment outside my own organization? What kind? Would I like it? Could I do it? How much would they offer? He experiences difficulty in finding someone interested in understanding him and in discussing personal and organizational problems. Meanwhile, he is moving further and further away from technical work. During this period he makes a decision and a commitment as to which direction he will take: technical specialist, technical director, program manager, program coordinator, systems engineer, or technical management. It is a difficult time for making such important decisions.

LIFE BEGINS AT 40 (44-51)—He is respected for his demonstrated ability. At this point, he may be reaching the top of the technical or managerial ladder. He has a strong urge to strengthen some of

his personal deficiencies. Typically, he shifts his *modus operandi* and begins to find a new, positive potential in his assignments. Emotionally, he tends toward frustration; physically, he notes the inroads of advancing age.

AGE OF WISDOM (52-up)—He is now less distracted and tends more toward individualized contributions. He achieves a more personal exchange with a few close colleagues. He has a clear view of his worth and applies his talents within practical limitations. He is willing to spend time in assisting others and exhibits concern for inexperienced personnel.



KEEP THE LINES OF COMMUNICATION OPEN

Supervising Others

The engineer who aspires to leadership in the world of men as well as in the world of engineering must, as we have said, understand himself and understand the growth patterns and problems of others. But he must do more. He must also learn the skills of supervision. Some of the more crucial of the supervisory skills are explored in the following paragraphs.

RESPONSIBILITY—Personal growth is the responsibility an individual has toward himself and society. When one accepts promotion to a supervisory position, he is agreeing to take on still another responsibility: the commitment to go out from oneself to others.

A group of men had just reported to a military training camp and were getting into military garb. While most were experiencing considerable difficulty, several had little or no trouble. One man, already dressed, began helping those who were still struggling. The officer in charge, after checking this man's other qualifying characteristics, put him in charge of the group, for the officer recognized that leadership implies service.

Promotion from purely technical to supervisory responsibility requires a greater appreciation for the personal growth of others and places heavier demands on one's time and energy. Human relations can be extremely demanding, especially work-oriented personal relationships which involve people of many different ages, interests, and walks of life. The assignment as a supervisor can be both terrifying and stimulating, but it is a highly rewarding activity if one remembers to remain natural, straightforward, and sincere. If a supervisor listens hard and tries to understand others, studies, and learns from his experience, he will enjoy and grow in his new area of responsibility. A supervisor can seldom handpick his staff. He must gradually and purposefully develop his ability to understand and direct the people who happen to work with him, remembering that they have their own unique set of talents, interests, and limitations.

PERSONAL UNDERSTANDING—Are there practical ways to develop understanding between the supervisor and his staff? A Federal labor-management arbitrator used to have an extraordinarily good technique for breaking deadlocks between representatives of rival factions. He would invite all the representatives to have dinner with him on condition that there would be no talk of the labor-management controversy. During dinner, the men all relaxed and talked about their families, sports, hobbies, their cultural preoccupations, and all the other small things that make a person's life. They got to know each other and began to develop personal friendships. When the formal discussions resumed, it was impossible for the men to see each other as corporate entities; they knew they had a great deal in common.

The boss-man relationship is not very well understood by either the boss or the man. In talking to either, a third person finds the same reaction: a need for mutual understanding. Men often meet together and talk, yet understanding and productivity are not always the outcome. Horace Mann once said, "Education is two people sitting on a log talking to each other." The relaxed atmosphere of mutual confidence and respect that this image conjures up is essential to true understanding.

When one is first promoted from engineer to supervisor, he tends to organize his people in a rigorous, methodical, logical manner. People are not so simple. The intermediate variables are infinite; the situation is constantly dynamic and

changing for all employees. Those who work for a supervisor have their own ambitions, their own interests. They need not be considered a drag simply because they do not fit the new supervisor's preconceived pattern. In fact, their special interests and responsibilities will, if properly used, reinforce their worth and ability—not detract from them. There are many examples where outside interests have materially benefited a supervisor, e.g., ham radio operator, special military training, model plane design and flight competition, or even an interest in reading, chess, or history.

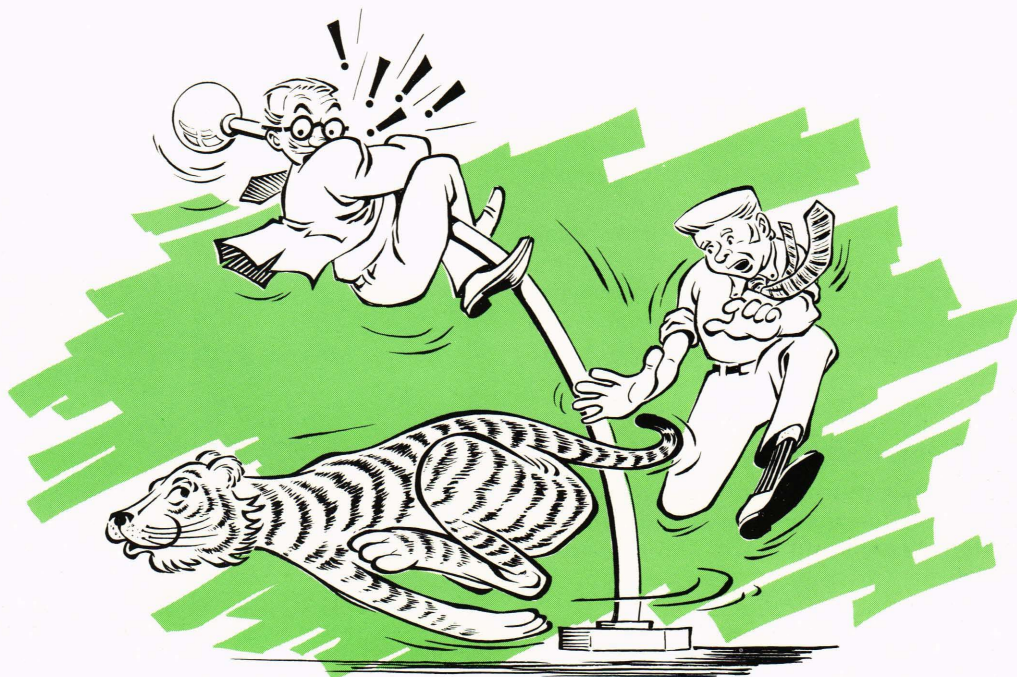
Understanding—and appreciation for another's talents—and showing an interest in those talents tends to develop the loyalty needed by both boss and man. Sharing of one's responsibility further develops loyalty. Of course, sharing responsibility does not mean relinquishing it. The good supervisor knows who is best qualified to replace him. He shows his confidence in the others by giving them more responsibility. This, in turn, induces them to produce more and makes loyalty a two-way street.

COMMUNICATION—One of a supervisor's most vital tasks is to keep open the lines of communication with the members of his staff. They need to feel he's a man they can talk to. As we have said, one of the most difficult things to do is analyze oneself. To do so is virtually impossible when one has that vague uneasiness that all is not well—when the work seems to have become mundane and pointless. Seeking help at this stage is extremely difficult, especially seeking it from

one's own boss, yet it is critically important for both the boss and the man. Many people have noted that President Kennedy had a singular advantage in this regard. His brother, a cabinet member, was constantly and intimately associated with the president. Thus, the President could always depend on receiving a sincere evaluation of his work from his brother.

Unless one expends a considerable effort to provide for frank and full mutual exchange between boss and man, a wedge of misunderstanding may work its way into the association. Then, one day an incident of little consequence will cause a complete breakdown of communication and confidence. This kind of breakdown is especially harmful when both continue working on the same assignment, for little things can accumulate, like grains of sand in a machine, to bring an entire operation to a standstill.

DYNAMIC BALANCE—Vital, continuing two-way communication results in three-way growth—that of the man, his subordinate, and the job they share. Thus, the supervisor is responsible for maintaining, through personal understanding and frank communication, a delicate, dynamic balance among growing men, challenging tasks, and effective leadership. That dynamic balance, when achieved, will result in a job well done by a satisfied staff ready for a still more challenging assignment. To achieve that balance is the challenge of supervision—a challenge as demanding as the most difficult technical assignment.



MAINTAIN DYNAMIC BALANCE BETWEEN JOBS AND EMPLOYEES