I. Introduction

The foundations of gerontology go far beyond the three papers on history, training and methodology which constitute this section of the symposium. For this reason it behooves us to lay a foundation for the entire Task Force before proceeding to a discussion of the specific papers.

As one reviews the present status of Gerontology as a science it becomes clear that far more effort has gone into descriptive gerontology than into etiological approaches to the field. Furthermore, most workers have attacked the field from the point of view of their specific disciplines, leading to a piecemeal unintegrated result, as pointed out by Klaus Riegel. This discipline-centeredness leads to deeper and deeper knowledge of a particular area but because of its isolation fails to interconnect with the contributions of the other disciplines. To hope for an Einstein to come along and integrate the piecemeal findings is a vain hope as Riegel points out. A shift from a discipline centered to a problem centered approach is essential if progress in solving the problems of aging is to be achieved.

While gerontology, like psychology has a long past, it has but a short history, especially in the U.S. In fact, any attempt to discover the
beginnings of the problem in the U.S.A. seem to point to the second quarter
of the 20th century as the beginnings of the problem. While the percent
of the population aged 65+ rose steadily from 2.7% in 1860 to 9.1 percent
in 1970 without any discernible jumps, the proportion of the aged males
who were gainfully employed in the labor market dropped from 68% in 1890
to 26.2 percent in 1969, with the most rapid decline occurring between
1930 and 1940 (11.8 percent points). Further evidence for implicating the
30's and 40's as the starting points for the aging problem is the fact that
the expectancy of life reached 66.7 years in 1946 and the dependency ratio
(ratio of 65+ to the population in the working age range, 20-64)
vacillated between 5-8% from 1830 to 1920 but then began to rise linearly
until it reached 18% in 1970. Thus while the problem of the aged has always
been with us and received recognition from local private and state welfare
funds its exacerbation in the 30's and 40's led to its recognition on a
national level and led to Congressional action in the form of the Social
Security Act and similar movements. We are, therefore, dealing with a
relatively new phenomenon and need not be discouraged by the modest progress
made thus far.

While the descriptive approach to the problem of aging which accounts
for the vast majority of the gerontological literature is an important first
step in investigating the problem, there are no systematic underlying
variables connecting the descriptions offered by research and service
oriented workers and consequently no integration within the research
disciplines and within the service specialties and least of all between
research and service offerings. We will not get any better integration
of the field until we uncover the sources of the aging process and because of our ignorance of these sources, we must resort to certain strategies to overcome our ignorance. One of the most effective strategies when faced with abysmal ignorance is to construct "as if" causes and then see where they lead us. This usually goes under the name of constructing scientific models and a brief survey of the field indicates that there are at least six such scientific models: ecological, developmental, learning theory, genetic, internal environment and neurophysiological models. Similarly, there are a variety of scientific models for therapeutic intervention -- (1) dyadic models (2) group models (3) public health models and others dealt with in the proper sections of this symposium. In similar fashion there are also a variety of training models which Dr. Birren has discussed. It is clear that an imbrication of the vast variety of models in the four areas of description, etiology, intervention and therapy and training is necessary for a successful attack on the aging problem.
II. Description of changes in functioning due to Normal Aging

Naturalistic observations on changes in functioning with age go back to the ancient philosophers and continue into the present. The most popular form these observations take are a description of stages of man. Those of Shakespeare, Proust, Plegot and of Eric Ericson are well known.

The stages described in the Ethics of the Fathers (Tractate Avoth) is perhaps less well known and range from Age 5 -- for study

50 for Counsel;

60 -- old age; 70 -- hoary head; 80 -- heroics (special strength);

90 -- for bending (beneath the weight of old age); and 100 -- as though he were dead and had passed away and ceased from the world.

But such stages, interesting as they are, do not help in providing assessment of man's functioning with age. Even the existence of stages which are qualitatively different from each other is debatable and may depend upon the level of abstraction that we are willing to entertain. For objective assessment we need to turn to systematic naturalistic studies, laboratory measurements and observation under controlled conditions.

The descriptive approach deals primarily with methods for documenting the signs of aging in terms of self-descriptive approaches, evaluations by others, psychodynamic investigations, and biometric investigations of the type already alluded to. The development of systematic structured interviews which Dr. Gurland addresses himself to are one way of assessing the aged and
self administered personality inventories, and attitude questionnaires, are o r descriptive approaches.

III. Etiology of Normal Aging

Let us now turn to the causes that lie behind the waxing and waning of man's capacities.

What models have been proposed?

The ecological model postulates that the causes of aging are to be found primarily in the forces that impinge on the ecological niche which the aged occupies. Given a good supporting niche in which his needs are cared for and opportunities for continuing his active life prior to crossing the Rubicon are provided, there should be little or no reduction of function when the niche is favorable, except for those functions for which the physiological substrate itself is actually in decline. Most of the served deterioration of functioning may be a product of the deleterious parameters of the niche. Research in this area has thus far depended on rather crude analyses of the characteristics of the niche, viz. socio-economic status, education, socialization etc. There is need for a better taxonomy of the parameters of the ecological niche e.g., social network analysis, isolation history and similar parameters.

The developmental model stipulates that the etiology of aging is to be sought in the transitional stage of passing from adulthood to the senium and the adjustment to the new stage of life which the person enters. You develop into aging just as you develop into childhood, adolescence and adulthood. The reduction in performance in physiological, sensory, perceptual, psychomotor and conceptual functioning that comes with age, the
dropping off of friends, relatives and family through death or mobility, the changes in self-image and goals accompanying retirement, threat of death, poverty and changing sexual functioning all conspire to alter the functioning of the aged in a negative direction. These are the factors that we need to examine in our attempt to understand the causes of aging and the prevention of deteriorative trends that come with age.

The learning theory model stipulates that the changes in behavior observed in the aging is a result of learning. You learn to be old just as you learn anything else in life — through reinforcement. Given the proper types of reinforcement and learning, no one need show the inroads of aging generally observed in our society. Even if there is physiological decline, we can learn to adapt to it and it's the failure to adapt which brings about the deleterious behavior. Most of this deleterious behavior may be a reflection of either low self-image, disuse, or lack of motivation and proper application of behavior therapy based on learning theory can eliminate it. Furthermore, institutionalization in nursing homes or types of public housing tends to reduce functioning because of the limitations of institutional life — a result of the formation of habits deleterious to welfare. This too can be prevented by proper application of learning theory principles especially through such devices as Friendly Visiting Services.

The lowered self-image in the aged is one of the most pervasive findings in gerontological surveys. It would be most useful to discover whether the lowered self-image is the cause of deteriorative aging or whether aging must inevitably produce a lowered self-image. If we could prevent a lowering of the self-image by proper behavioral therapy, perhaps much of the so-called aging effects on behavior could be prevented.
The genetic model stipulates that the limitation of functioning coming
with age is a form of built-in obsolescence via our hereditary endowment.
We must remember, however, that genetics is not an island unto itself -- the
environment must interact with the hereditary dispositions in order for them
to develop. Therefore, genetics must not be regarded as fate -- and proper
steps can be taken to prevent deleterious genetic tendencies and encourage
benign tendencies.

The internal environment model stipulates that the sources of aging are
to be sought in changes in the metabolic processes and contents of body
fluids. Immunity to any proliferating tendency on the part of some cells
has been implicated in the prevention of cellular breakdown and interference
with this process, or autoimmunity has been postulated as the source of aging.

The neurophysiological model postulates that the source of aging is to
be sought in information processing which is mediated by the neurophysiology
of the organism. The loss of brain cells, the creation of plaques may
militate against the usual processing of information and bring about the
changes that are characteristic of aging. Thus aging may be regarded
as due to a series of subtle cortical insults which interferes with
information processing.

Each of the above models has the virtue that it has given rise to research
for determining its tenability and in this way added to knowledge regarding
the normal aging process. In order to test the tenability of these various
models, it is important to develop hypotheses and test them to determine
whether the model holds. For the ecological model, we must find techniques
which will test the tenability of hypotheses postulating the role of ecologic-
All factors in the aging process. Since the ecological factors reflect the social-cultural-physical milieu of the niche in which the person is located, the technique must reflect the cultural influences of these factors and the best approach would be to apply culture-dependent techniques such as interviews or observational techniques.

For example, in examining the subject's attitude towards work, his role as a worker can be examined. The information sought will be highly culture dependent since attitude towards work varies so much from culture to culture.

The developmental and learning theory model can best be tested by culture fair techniques. These consist of techniques which though imbedded in the local culture have cross-cultural equivalents. For example, the influence of isolation can be studied by means of greeting behavior or grieving behavior. These behaviors, though bearing local color nevertheless have their equivalents in all cultures. The genetic, internal environment and neurophysiological models can best be tested by means of culture free techniques. Thus, the catecholamine balance in the internal milieu can be tested by laboratory techniques regardless of what ecological niche a person occupies. Though there may be local norms for these determinations, the method for making these determinations is independent of the culture of the milieu.
IV. Training Models

How to prepare research and clinical workers to deal with the problem has been presented by Dr. Birren. His review has been both comprehensive and impressive. With regard to research training, there is a tendency to relegate such training to programs in Developmental Psychology with unfortunate consequences since Developmental Psychology today is focused on the earlier ages to the exclusion of the senium. The majority of the funds, fellowships and academic positions are in the neonate and childhood studies. Theoretically, aging is part of development and should remain in this spectrum, but administratively and financially the developmental umbrella has been disastrous for gerontology. Perhaps administrative
reorganization could improve the situation.

One area that Dr. Birren failed to stress is the training of non-psychologists for gerontological work. It is high time that we realized that we alone can not cope with the problem and that training for this field requires the wide spectrum provided by the various scientific models discussed earlier as well as professional experience for a wide variety of individuals to implement the service needs of the aged. One interesting question arises when we contemplate the gerontologist of the future. If he is to be conversant with ecology, development, learning, genetics, internal environment and neurophysiology can he remain a psychologist? The future belongs to those who prepare for it! If we can develop methods based on psychological principles such as learning theory and developmental theory, but also provide knowledge in the other areas, the gerontologist of the future may be closer to psychology than to sociology or psychiatry, our two chief competitors. However, I am hoping that each of the disciplines that have contributed to gerontology in the past as well as those who contribute to it now will so enrich gerontology that distinguishing between these influences will be an academic question and could be done only historically as is the case now with the attempt to separate the early influences of Celt, Anglo-Saxon, Roman, French etc. on Modern English.

Regarding the number of professionals needed for caring for the problems of aging, it is unfortunate that most of our estimates are based on in-patient data. The number of aged individuals seeking outpatient care is notoriously low. With the development of population surveys it may become possible to estimate more accurately the service needs of the aged who now
receive no care. The numbers required will be considerably larger than those now contemplated. I am reminded of the response of a Dutch psychologist to my comment that we need more service people to care for the aged. His response was, "you are simply asking for more boys to place their finger in the cracking dyke!" The better way is prevention. By identifying the vulnerable high risk population and supplying them with preventive attention, the flood tide of service can be halted. To permit the aged to break down and then bring in the repair man to put them together again is wasteful of personnel, funds and human happiness.

One problem remains -- the one which Dr. Klaus Riegel raised in his provocative paper -- namely how can we make our scientific and human efforts more efficient. He roundly scolds current approaches to research and training as being too competitive and insufficiently cooperative and wants to revolutionize current procedures in his youthful zealot-like way. I can not help but empathize with his desires but at the same time am somewhat surprised at the unusual note which he strikes in his attempt to substitute cooperative group effort for individual initiative. To introduce cooperative effort in research as a classroom exercise, is one thing, but to limit research to inter cooperative efforts, even disciplinary efforts, is bound to reduce creativity. His condemnation of collecting data for data's sake, does not hold true of all scientific endeavor.
No good scientist collects data for data sake. Even those who disavow
it, carry models in their heads which dictates the kinds of experiments they
do and the kind of data they collect. I have tried to delineate the models
now filling the heads of many workers. There are probably others which I
have not covered, though, I believe that I have been able to classify most
research into one of the six postulated models and their combinations.

As for the stress on historical research and the systematic retrieval
of old findings, I again tend to agree that it is desirable, depending upon
the nature of the material. In my own studies for example, in the world
literature on prognosis in schizophrenia, I discovered that nine-tenths of
the articles were worthless for my purpose and though I did manage to find
some underlying currents, the tremendous effort expended was hardly
recompensed by the results.

V. Methodological Approaches

The methodological problems in aging research has been duly discussed
by Ann Greenhouse. Let me first point out that in order to deal adequately
with the research problem in aging, we need tools and instruments geared to
the task. Most of our instruments are culture bound, reflecting the cultural
milieu in which we find ourselves. This perforce is unavoidable in dealing
with the ecological model. However, in dealing with research emanating from
the developmental and learning theory models we need to develop culture fair
techniques translatable from culture to culture. If the attitude towards
self, labor, job, family, is the important area for investigation of the
developmental model, we must transcend the mores of our major society if we
are to capture the essential problems of a subculture by providing culture
fair measures. A puritan ethic can hardly be of use in a manana culture!
Then, there is need for culture free indicators in studying the brain
function, internal environment and hereditary models. The development of
such tools is a sine qua non.
One of the striking differentials in research findings are those which contrast the results of longitudinal and cross-sectional studies. Both Dr. Birren and Dr. Greenhouse have addressed themselves to this question. There is one advantage of longitudinal studies which needs to be kept in mind — their historical and follow-up values. Perhaps the best way to predict future behavior is to postdict past behavior, and for this purpose longitudinal studies despite their selectivity, biases and practice effects on testing, can never be beat by other approaches. The hope is that patterns of individual life progress can be found which characterize subgroups of individuals. These subgroup cohorts can provide prediction of future behavior, both adjusted and maladjusted, so that we can identify the high risk populations for whom intervention is essential. In dealing with such data we are essentially dealing with time series and fortunately the statistical treatment of such data have recently been fortified by powerful methods which should become part of our statistical lore.

VI. The future of gerontology

As one views the year 2,000 with reference to the problem of the aged, it becomes quite clear that a larger and larger proportion of voters, consumers, men of leisure as well as workers will be drawn from the age group beyond 65. What can one say that has not already been said regarding the changes this shift in population will bring. It will be as great if not greater than the shift from rural to urban centers and its impact on education, industry, health and business can only be guessed at. How to prepare to serve such a tremendous population is a crucial issue. Certainly such areas as play, recreation and continuing education will play an important
part. But the greatest service that the psychologist can provide is to prevent the occurrence of accidie, the noonday demon of the monasteries of the Middle Ages, which arises from too much leisure, of boredom from too much education and of isolation from too much lonesomeness.

Summary

I have tried to lay down a framework for the Task Force Reports on Aging by proposing a series of scientific models for the etiology of normal senescing and of psychopathological aging and have tried to integrate the contributions of my three colleagues into this network. It was a tour de force I fear, but as I forged the links between the three papers and my own thinking I seemed to have convinced at least myself that some such grand scheme was essential if the research and service we offer in the aging area is to be other than a piecemeal offering.

Each of the six models presents a different way of approaching research and training and the corresponding service functions for gerontology. Which is the correct approach? Is there a best approach? I can answer this question only by appealing, for example, provided by the complementary explanations of light as a waveform and as a stream of particles. Here we can accept both explanations, since each explanation depends on the instruments used for measuring light. In psychology, the instruments used are largely the experimenters themselves and they should be free to choose their own preferred models. Furthermore, all of the models are mutually interdependent and differ only with regard to the aspect on which they focus.

The interaction
Research in science is the last refuge of creative scientific men. Here his fantasy is permitted to pit itself against nature's secretive ways. To place a straight jacket on these creative urges would ruin the last hope of man. Besides, no matter what your fantasies regarding the aging or developmental processes are, to bring them across the threshold of reality is the problem of research -- that is the creative act ---. The validation of such ideas is relatively a pedestrian act of experimental evaluation for which rules and systems exist. For the creative act itself, no guidelines have yet been developed. That is why we must encourage it freely in the young, and dare not tamper with it by imposing limitations on it by such impositions as cooperation or competition or of historical or ahistorical approaches. How to free the new research worker from the old moulds and provide him with new vistas is indeed the most important task of the educator and established researcher in this field.