of the adenine-guanine pathway; the enzyme has been partially isolated from both the wild strains and a feedback-inhibitionless mutant. Moreover, the enzyme from the mutant is less inhibited by identical concentrations of the end products. Oshima (Osaka) discussed how the enzyme α-glucosidase (maltase), which is polymeric, can become a functional enzyme even when made of isomers encoded by different genes. H. Tamaki (Kyoto) showed that at least two polymeric genes control starch fermentation in *S. diastaticus* and these genes are regulated by inhibitor genes brought in from an industrial alcohol yeast (Hakken No. 1, *S. cerevisiae*).

Roman and Friis (Copenhagen) in studying mitotic gene conversion in a/a, α/α, and a/α diploids have found that after nitrosoguandine treatment, x-radiation, or ultraviolet radiation, the a/α cells convert at a frequency 15 times that of a/a or α/α cells. Mortimer stated that mitotic gene conversion occurs at the same frequency in haploid cells disomic for chromosome VIII as for the a/α diploid. Roman has evidence that induced gene conversion during mitosis is not the result of the formation of two heteroduplexes, as current hypotheses suggest. Fogel (Brooklyn) reported that J. Wildenberg (Brooklyn), by irradiating and obtaining pedigrees of synchronized populations, has proved that the conversion events occur during both G_1 and G_2 in mitotic diploid cells. Fogel and Mortimer proved that gene conversion during meiosis is a process of complete fidelity to the nucleotide level; also, mutants of *arg 4* at distances of 130 nucleotides from one another usually convert together. Occasionally, mutants convert together when they are at distances 1000 nucleotides apart. Hurst (Brooklyn) and Fogel confirmed these findings for *his 1* and *thr 3*, and also find that conversion may occur prereplicatively during meiosis with hybrid DNA extending over two loci. Gutz (Dallas) has also shown that simultaneous conversion is more common between alleles close to one another in the *adenine 6* locus of *Schizosaccharomyces pombe*. Further, Gutz found an *adenine 6* mutant which gives a peculiar pattern of gene conversion; the behavior of this mutation cannot be easily explained by either the Holliday or Whitehouse model of genetic recombination, but fits well into a model suggested by Herbert Taylor.

Roman and Takahashi chaired the last session which included fine-structure mapping and cytology. Snow (Davis) finds that methyl methanesulfonate is as useful as x-rays in fine-structure mapping. Like x-rays, methyl methanesulfonate linearly induces prototrophs at exposures well below levels fatal to cells. Mortimer discussed a selection system that Rodarte (Berkeley) is using to find recombinationless mutants of yeast; at present 18 have been found. Four mutants are sensitive to x-radiation but not to ultraviolet radiation; 14 are not sensitive at all to irradiation of either kind. Roman described a technique for obtaining pure suspensions of spores, virtually free of vegetative cells. Nagai described the use of the flower frog, kenzan, for making identical replica plates.

H. Tamaki (Kyoto) showed pictures of meiotic chromosomes; he uses strong Flemming fixative on young asci before applying snail enzyme followed by Giemsa stain. Gutz described the work of Treichler (Dallas) on Robinow bodies in the cells of yeast nuclei; usually, one can be seen in a haploid cell and two in a diploid.

A committee composed of Mortimer, Sherman, and von Borstel was appointed to undertake changes in nomenclature of mutants; Nakai and Magni are consulting members. Mortimer proposed the use of three-letter symbols following the bacterial system and the elimination of subscripts and superscripts. Fogel is making the arrangements for a yeast genetics stock center at Brooklyn College. The next yeast genetics conference probably will take place in 1970 in Italy or Canada.

The conference was supported by the Yeast Industries Association of Japan, the Organizing Committee of the 12th International Congress of Genetics, and several other organizations and individuals.

This conference was arranged by a committee composed of J. Ashida (Kyoto University), Y. Ikeda (University of Tokyo), A. Yuasa (Japan Women's University, Tokyo), S. Nagai (Nara National Women's University), T. Takahashi (Brewing Science Research Institute, Suita), Y. Oshima (Suntory Ltd., Osaka), N. Yanagishima (Osaka City University), H. Tamaki (Doshisha Women's College, Kyoto), and S. Nakai (National Institute of Radiological Science, Chiba).

Foreign visitors at the conference were impressed by the courtesy, hospitality, and friendliness of their Japanese hosts. The meeting was made memorable not only because of its scientific interest but also because of the numerous festivities that were so generously provided.

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Behavioral Sciences and the Medical School

It is apparent to most physicians that basic medical and clinical sciences cannot totally explain the phenomena of the sick patient and especially how he is living with his illness. Such explanations come only through work with the behavioral sciences in a clinical setting.

These patient-care focused problems can be approached with psychologists and sociologists. Areas of focus such as the developmental history and psychological theory which could explain patient behavior, or an analysis of the kinds of activities that physicians and other health care personnel are providing in relation to patient care, are pertinent areas for behavioral science investigations. Such investigations were discussed at a conference held by the National Institute of General Medical Sciences, in Bethesda, Maryland, 25 September 1968.

Experience dictates that as this becomes a useful activity, interns and residents and some of the medical students will become interested. Over the years such clinical discussions of patients can be expanded to an exploration of specific research in basic behavioral science and clinical projects. Questions asked in the clinic then become amenable to possible analysis in a much more structured and highly controlled laboratory setting.

For example, investigations on physiologic responses to a set of environmental stimuli can be conducted in parallel to the clinical patient-care process, programmed in part by the sociologists and psychologists to measure both the physiologic and the metabolic, and the psychological and social parameters.

Such a basic-clinical relationship can

evolve in many different ways. In one institution a division of behavioral medicine has evolved in the department of medicine. This suffers from disadvantages. The subspecialties of medicine are aligned along traditional anatomic organ system arrangements, and are, in effect, the recruiting and substantive focuses in departments of medicine. A group interested in behavior must ask a legitimate question: "Where is a legitimate definitive career path that will not leave in doubt my role, either within the academic or clinical arena?"

For example, individuals who look at the nervous system as the base for behavior would best be neurologists. On the other hand, a person interested in more abstract and psychological formulations is forced to be in psychiatry because in general medicine he will be relatively isolated from colleagues.

The interest in behavior has been largely in the department of psychiatry. As a result, the behavioral sciences are essentially "black sheep" in the medical school. Unfortunately in psychiatry the focus and interests regarding psychological problems cannot really be extended into general medicine. Fundamental studies of patient response to illness or physiological responses to environmental stimuli are too often supported by the psychiatry department in a less than adequate manner.

This is important, for about one-third of all medical students say they are interested in academic-scientific careers, one-third in specialization, and one-third want to go into psychiatry. When questioned, the students admit that psychiatry was selected because it was the only avenue in medical schools where they could relate to the behavior of patients. How to maintain the accouterments of the physician and still be concerned about the psychological issues that really pertain to illness is a problem not yet solved in the daily behavior in a medical center. To produce more physicians in the next 10 to 20 years who are interested and at ease with behavioral sciences in relationship to clinical medicine requires that training be done within the context of clinical medicine, and that it should not be relegated to a companion arm of the department of psychiatry.

Entering medical students bring a real interest in the sociological factors that relate to health. Somewhere in the educational process, this becomes less pertinent, less relevant, and less exciting. The problem is to keep this social attitude in the student by making behavioral sciences more visible in the medical school to the beginning student.

A good example of how behavioral sciences can be integrated is in the Department of Neuroscience at the University of California at San Diego, which is planning integrated training in neuroanatomy, neurophysiology, neuroendocrinology, neuropharmacology, neuroethology, and neurology in a Department of Neurosciences. Three lectures per week covering matters of conventional psychology with anthropologists, sociologists, economists, and psychiatrists will be given throughout the first 2 years of medical school. The allover plan involves lectures, laboratories, and clinics. The students will meet every Saturday morning and see patients to keep the focus on the medical problems. If some young man becomes interested in sociological studies, he will be able to take graduate courses in the sociology department or in any department that he wishes. This may help solve some of the problems previously mentioned.

The behavioral sciences have many points of intersection with medical training and research. (i) One of the most important is expansion of knowledge of behavior beyond the usual college or university setting; (ii) another clear problem is in the doctor-patient relationship; (iii) psychosomatic medicine is another behavioral problem area at all levels of medical education and medical activity; (iv) delivery of medical services is a behavioral sciences problem, a sociological, and cultural problem. How do you get people to accept fluoridation? To come to clinics? How do you organize medical services in order to be able to deliver them?

The mechanics of administration of a behavioral science unit varies widely. Clearly, there is the possibility of having behavioral sciences as a basic science to psychiatry, public health, and community medicine. Experience has shown it can also be accomplished as a division of psychiatry, but in this case one must accept certain disadvantages. The idea of the creation of an institute or center is a good one for the behavioral sciences if it interacts with the other departments and depends on them; a behavioral scientist in the physiology department or in pediatrics can be a member of an institute of behavioral sciences.

As a general rule, research within a discipline fails when attacking a complex problem in the realm of public affairs. These problems lend themselves to solution by bringing together people who are interested in the problem from different disciplines.

One of the great troubles universities are having in working with any professional school—medicine being one of them—is separating two efforts—basic research that is fundamental to the discipline and a solution of problems facing the general public.

One of the best approaches to the problem would be to emphasize a concern for behavior that already exists in medical schools, and extend it into the realm of behavioral science, that is, to give it more of a scientific foundation than it now has. The practice of medicine is 50 or 60 percent psychological or sociological. There are many cultural, religious, national groups who come for medical assistance and then go back into their home or community where very different circumstances influencing behavior must exist. What should be the rationale after diagnostic appraisal and treatment in order to send the patient back in the best possible way into situations which are exceedingly different because of his background?

A psychologist, or sociologist, or anthropologist cannot be employed to solve the problem. We must establish the fact that there is a need for training and experience which incorporates behavior and a science of behavior into the medical curriculum. This training must involve the laboratory-based psychologist as well as the clinical, patient-oriented psychologist dealing with much tougher problems but with poorer techniques, perhaps in a less valid way but with a concern for the individual patient.

Curriculum, perspective, and background in behavioral sciences should begin and continue throughout the period when students are concerned with patients and dealing with the real-life, clinical situation. And the techniques and the specific material which involve the brain and behavior should provide the concrete technique and technology for doing something about variables in human behavior.

One of the problems to face in the future will be the delivery of health services in the big city ghettos by medical students whose life pattern is usually a middle-class, comfortable environment which leaves them unpre-

pared for violence, filth, vermin, crowded living, battered babies, and drug use. A doctor would not be sent to Brazil without teaching him something about tropical diseases but our medical schools assume a doctor can be sent into this very strange world that exists in the city without telling or showing him about life there.

One of the things that behavioral science can contribute to medicine and medical education, and maybe the most important contribution it can make, is to turn its attention to who goes into medicine and what qualities they should have. It may be that not all medical students should have the same medical school experience. The medical school has evolved so that it is no longer a school but it is of itself a university. And no one really expects graduates of a university to have the same kind of experiences.

There is the companion problem of professional identification for people who go into the behavioral sciences, the kind of politics that goes along with professionalism. If the field of behavioral sciences is to be viable in the medical setting, it must keep in touch with the primary motivation of students going into medical training, namely the care of patients.

The role of behavioral sciences in the medical school, up to now, has been a specialized role, carrying out behavioral science instruction in the medical setting or training researchers in behavioral sciences in the medical setting, or the training of people for service in specialist roles. But the question is whether behavioral sciences have a role in the general medical education of students and whether the behavioral sciences, along with biochemistry and physiology, will be part of the basic training of all medical students. Behavioral sciences in medical education are important because they provide a means by which medicine can respond better to the contemporary public issues in the health field. We have accepted the principle that universities and medical education are supposed to respond to public need as the true basis of a public institution. In order for this response to be effective in contemporary affairs the behavioral sciences must be an integral part.

Behavior, both personal and social, is an important component of the life of an individual, whether well or sick. Its appraisal and assessment at the time of the first contact between patient and

physician, in the formation of the diagnosis, and in the planning of treatment is most important. As treatment goes on and as follow-up treatment ensues, the assessment of behavior and plans for its adjustment and integration in the family and community shift from the intrapersonal to the interpersonal or social-group level.

We must develop programs to enhance the understanding by physicians and behavioral scientists of the doctor-patient relationship and the interaction between the patient and his social environment. At the same time it is to be emphasized that this will provide a unique opportunity to expose behavioral scientists, especially graduate students in behavioral science, to the behavioral and social problems inherent in the field of medicine.

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Laser Scattering

Approximately 130 scientists attended a symposium on laser scattering in honor of the late Peter J. W. Debye held at Cornell University, 24 to 26 June 1968, under the auspices of the Physical Chemistry Division of the American Chemical Society and the Chemical Physics Division of the American Physical Society. F. A. Long (Cornell University) delivered the opening remarks. Attending the banquet on 25 June were three generations of the Debye family. A. M. Bueche (General Electric), a former student of Debye's, was the after-dinner speaker.

Participants at the conference considered problems related to laser spectroscopy in chemistry and physics with emphasis on techniques which take advantage of the coherent properties of lasers. Speakers drew attention to the use of lasers in physical science; however, they also discussed increasing potential of lasers for research in physics and chemistry as well as in engineering and biology.

Laser research and development have proliferated at a great pace in the last few years. The design and use of lasers draw on experience and knowledge in fields related to physics, such as quantum electrodynamics, electronics, and optics. Consequently, the symposium not only provided opportunities for the exchange of ideas among experts, but