

DR. JOSEPH TIFFIN

As was the case with several other industrial psychologists who entered the field during the past half century, I got into the area largely by chance and through the "back door". My undergraduate education was at the University of South Dakota, from which I was graduated with a major in philosophy and psychology in 1927. I went immediately into graduate work at the University of Iowa in the fall of 1927, knowing only that I would like an advanced degree in psychology and then a position at some university or college. I registered for three courses in psychology and two in philosophy. After I had been at Iowa a few weeks, it became apparent to me that the emphasis in psychology at Iowa was an experimental psychology, so I thought up what seemed to me would be a fine problem in experimental psychology. I had read a great deal of Koffka and Koehler during my undergraduate days, and I recalled that one of these men pointed out that cats enclosed in a problem box with the mechanism enclosed in glass (so the animals could see out) got out much faster than a control group of animals in a problem box where they could not see the mechanism. I proposed this problem to Dean C. E. Seashore who was head of the Department and also the dean of the Graduate School. It took the Dean about two minutes to change my mind. He simply said we do not work with animals at Iowa, that they once had some dogs and they all died, and that if I wanted to work with animals I should go to Chicago and work with Harvey Carr.

After this let down and after I had a little more time to think, I noticed that a great deal of the work at Iowa was in the psychology of music. With this background, I developed an idea that I thought would appeal to Dean Seashore. This was to measure the effect of music on people, using the psychogalvanic reflex. I proposed this idea to the Dean. He listened for about three minutes and then said the psychogalvanic reflex did not measure anything, and I could not use that problem for a Master's thesis.

At this stage I was somewhat in despair, so I asked the Dean if he would suggest a problem for me. Without delay he said, "Tiffin, you now have the right idea. Let's be sure you are taking the right courses for us to follow up on it." Incidentally, he always addressed me as "Tiffin" as long as I knew him. Without further discussion, he said I should drop the philosophy courses I signed up for, and take courses in acoustics and experimental phonetics. He handed me "drop" slips for the courses in philosophy and "take" slips for the other courses and told me to see the heads of the respective departments to get these slips signed. I went to Dr. E. D. Starbuck, who was head of the Philosophy Department, and he refused to sign the drop slips. He told me that this was the first year for the new Department of Philosophy at Iowa, that until that year philosophy had been a part of the Department of Psychology and Philosophy, and that he would not permit the Dean, who was a psychologist, to take all the students who had an interest in philosophy and make them into psychologists. Dr. Starbuck and Dean Seashore then had a twenty minute conference, at the end of which Dr. Starbuck signed by drop slips.

I then went to the heads of the other departments to have them sign my "take" slips. Dr. Stewart, who was head of the Physics Department, said that at this stage of the semester it would be impossible for me to catch up and I probably should not sign up for the course in acoustics, but with the dean's help we persuaded him to let me make the attempt. I went through a similar experience with the head of the Speech Department who also permitted me, with some misgivings, to sign up for the course in experimental phonetics.

About ten days after I got into the new courses, the dean called me into his office and said, "Tiffin, I want you to work with Metfessel for your thesis." Metfessel had taken his Ph.D. under the dean a few years earlier and was in the process of analyzing the sound waves from the voices of well-known (usually opera) singers. He had discovered that the sound waves usually contained a vibrato, a pitch variation of about a semi-tone occurring about 5 to 7 times per second. Working as Metfessel's assistant, I helped him record and measure the sound waves of a score or more of operatic singers, using Victor Red Seal records as the source of the voices. Then, using this method of analysis, I developed my Master's thesis on the characteristics of children's vibratos, using children from the University of Iowa Elementary School, and found that there was an incipient vibrato in their voices. At about this time the Dean called me in one day and said, "Tiffin, how can we produce a synthetic vibrato?" I told the Dean to give me a day or two and I thought I could solve the problem.

It did not take me long to realize that a synthetic vibrato could easily be produced by using what was known as a "tone whistle". I had played in a dance band during my South Dakota days and remembered that one of the band members often took a chorus of a tune on a tone whistle, a whistle with a sliding plunger which changes the pitch of the tone produced. By shaking the plunger while the whistle was being blown, he had a simple method for producing a synthetic vibrato. I went over to a local music and bought a tone whistle (which cost about two or three dollars), brought it back to the laboratory, mounted it on a stand with a crank so that by turning the crank while someone was blowing the whistle we had a synthetic pitch vibrato. The Dean, who was quite a gadgeteer, was quite impressed and said, "Tiffin, can you also produce a synthetic intensity vibrato?" I said "yes, that would be even simpler. We will simply put the tone whistle in a box with a sliding door and by attaching the crank to the door we will produce an intensity vibrato." The whole thing was so simple that I wondered why no one else had thought of it, but nobody had; so it worked out to my advantage with the Dean. He said that I should publish an article on it, and with his sponsorship I published a short note in Science, 1929, called "A Vibrato Tonometer".

I received the M. A. degree on a schedule in the spring of 1928. That summer I began work on the Ph.D. For my second year of graduate work, 1928-29, I was awarded one of the Dean's Eastman fellowships in the psychology of music. Things went very well and in my third year, 1929-30, I received another Eastman fellowship. My research still centered on the vibrato; and my Ph.D. dissertation involved a psychophysical study in which I determined the pitch that a person hears while listening to a vibrato. It turned out to be the geometric mean of the frequencies making up the vibrato. The research enabled me to make a thorough study of various classical psychophysical methods, and laid the groundwork for my much later work on inspection in industry.

I received my Ph.D. degree in 1930, and then for one year was a fellow of the National Research Council. I remained at Iowa during that year and continued my work in the fields of acoustics, music, and speech. The next year I was appointed assistant professor at Iowa, 1931-34, and then was promoted to associate professor. In 1937 I moved to Brooklyn College where I remained for only one semester.

In February 1938 I received an offer to go to Purdue, which I quickly accepted. It was a research appointment in industrial psychology. I had never been inside a plant in my life, but I had known the man who hired me, F. B. Knight, at Iowa some time before, and he knew that I was reasonably bright, had good work habits, and he assured me that, given the chance, I would get the job done.

Knight asked me to go around the state with R. J. Greenly, a Purdue staff member doing supervisory training for many companies in Indiana. Among these companies was the sheet and tin mill of the U. S. Steel in Gary. At this mill I saw several problems that could be attacked utilizing my background in psychology and psychophysics. One of these was the inspection of tin plate by what were called the "sorters". The sorters were girls who inspected each sheet (about 2 ft. by 3 ft.) for flaws of any kind before the sheets were shipped to the customer, one of the major can companies. I worked out a method of evaluating the job performance of each sorter, which consisted of a coded stack of sheets, which each girl sorted while being timed with a stopwatch. Since each girl inspected the same coded stack, we were able to reliably measure the job performance of each sorter, and also determine for each girl which particular defects (if any) she was overlooking.

This study immediately had several impacts on the sorting room operation. First, it showed there was little if any relation between the merit ratings that were in use throughout the mill and the job performance of the sorters. In fact, the only significant relationship we found was the rating on overall job performance and the quality of work done on the coded job sample, and this relationship was negative; the girls rated best in overall job performance were fastest but least accurate on the coded job sample. This finding resulted in MISSING NEXT PAGE (7)

From Bausch and Lomb's point of view, to identify among present employees those whose vision was not adequate for their jobs, so that they could be referred to a professional eye doctor for the needed eye care. The reason for Bausch and Lomb's interest in this project was quite simple. It had been known for a long time that a large majority of employees whose vision was not adequate for their jobs could be completely rehabilitated by using properly prescribed correction. Bausch and Lomb was one of the largest manufacturers of lenses and frames and they felt that if employees in need of eye care could be identified and referred to ophthalmologists, Bausch and Lomb would get at least its fair share of glasses business thus created. The plan worked very well. We developed what was called the Orthorater, a battery of visual skills tests, 7 at "distance" (the optical equivalent of 20 feet) and 5 at "near" (the optical equivalent of 13 inches).

As research with the Orthorater continued in many cases what the companies involved had never suspected -- namely that on near-point jobs there was a negative correlation between distance visual acuity and production on the job, but there was a high positive correlation between near point acuity and job production. We also found a very low correlation between near and far point visual acuity. These findings meant that selecting employees with good distance visual acuity did not at all insure that they would have adequate near acuity.

During this whole period and particularly as the programs were put into industry, we worked very closely with a joint committee on industrial vision of the American Academy of Ophthalmology of the American Medical Association, and also with a Committee on Industrial Vision of the American Optometric Association. For years the medical doctors had emphasized distance acuity. This was due partly (or largely) to the fact that all states award compensation for visual disabilities based on the loss of distance visual acuity. This may be good for purposes of compensation, but it does not alter the fact that for near jobs the employee needs excellent near (not distance) visual acuity. As we worked with the two professional committees named above, we made it clear that use of Orthorater in industry would never in any way usurp the position of the eye professions. It would only enable us to identify the

employees in need of eye care and refer them to professional men for help. The doctors quickly realized that our work was simply a handmaiden to their respective professions; however, it took some time to learn how best to cooperate.

One actual case history will illustrate this point. The standard correction (glasses) for myopia (near-sightedness) is to prescribe concave lenses, which bend the light rays coming from a distance so they go into the eye as if they were coming from a near point. With a correction like this, the near-sighted person can see more clearly at distance. But the use of such lenses at near point requires the individual to focus at still closer than he would have had to focus without the glasses. One girl employed on the job of "looping," a very near point job in a hosiery mill, noticed that she was having trouble with her eyes and went to a local medical doctor for help. He prescribed a pair of concave lenses and when she went back to work using these glasses, she found that she had still more visual trouble on the job. One noon I had lunch with her eye doctor and told him that one of his patients did not seem to be helped by his prescription. I told him that she made her living on a 12-inch job. This was the first time he knew of the distance of her work and he immediately called the girl and told her not to wear the glasses at work but to put them on after work if she was going to the movies, driving a car, or playing golf.

As a result of such research and our presentations to many groups of ophthalmologists, many of them began to realize that they should prescribe glasses geared to the occupation or job a person is doing, and that the most modern job requires near-point rather than distance visual acuity. A little later we conducted an investigation for the Office of Naval Research to determine the visual requirements of men using modern fire control instruments. It was found in this research that normal vision at 25 to 30 inches is all that is need to operate this equipment; the traditional 20/20 vision at distance, that had always been required in the Navy, is not necessary for this job.

Toward the end of 1939, I began to write a textbook in the field of industrial psychology. Good progress was made on this manuscript and early in 1941 it was ready to be published. I had previously co-authored a text on elementary psychology that had been issued by a well-known publisher. I felt a certain loyalty to that publisher, and I had told the college representative of this company that, when my new book was ready to be published, I would be glad to submit it to them. I therefore sent the manuscript to this company early in 1941. Two or three months later they returned the manuscript to me, saying that the United States probably would get into the war before long and that, in their judgment, the book should no be published until after the war.

Prentice-Hall representatives had discussed the book with me several times while it was being written, but I had held them off because of my previous semi-commitment to the other company. When I received the manuscript back, I immediately called Prentice-Hall and they decided to publish the book at once.

As I look back on the matter, I see that every aspect of it was fortunate. The first company was primarily a publisher of old-line academic textbooks. They had no industrial contacts and could not have given my book adequate promotion. Prentice-Hall had many industrial contacts and were prepared to promote a book on industrial psychology. They moved very fast indeed and in spite of the paper shortage had the book on the market in June 1942. By that time, of course, we were at war and during the war the U. S. Armed Forces Institute adopted my book for a basic course in industrial psychology. Prentice-Hall published a special paper bond edition for this purpose and well over 100,000 copies were purchased by the army. In the meantime, it had been adopted by a good many schools and in due time a

revision was called for. I published new editions in 1947 and 1952. Later editions were finished in collaboration with E. J. McCormick in 1958, 1965, and 1974

After the United States entered the war in 1941, I had the opportunity to use my skill in industrial psychology in several ways with different companies and organizations. The one that comes quickly to mind was the Kingsbury Ordinance Plant. This company built an ordinance plant from scratch in a section of land south of La Porte, Indiana. We noticed the plant being built and after it was in operation, I drove up to the plant one day and suggested to the personnel director that we might be able to supply some personnel tests that would enable him to select better employees. In a flash he said that they were employing every applicant and that, applicants being as scarce as they were, he would not consider rejecting any able-bodied person.

After thinking over his response for a few minutes, I suggested that he might use personnel tests for the placement of employees so he could make the best use of their skills and abilities. He thought that might be a good idea, and gave me some job descriptions of a few of the jobs he was having trouble getting properly filled. One of these jobs involved the assembly of quite small shells. The task obviously required good finger dexterity, so I developed what came to be known as the Purdue Pegboard to identify applicants with adequate finger dexterity for the assembling of the small shells. Our shop man at Purdue made up some 20 of these Purdue Pegboards, and the company immediately began to use them to identify people who would be placed on this job. This work was really an early application of the concept of "content validity" -- i.e., the job called for fine finger dexterity, and there was not time to work on criterion related validity. After a few weeks of placement on this job by means of the pegboard, production showed a marked improvement, and the company made a substantial monetary gift to Purdue to acknowledge this help we had given them.

Another example of the use of test in a plant during the war was in a well-known gear company. This company, perhaps the leading company in the town, had never employed women. But during the war there were no men available; they had to employ women. I will never forget the group of well over 100 women who applied at the plant the morning after the ad appeared in the local paper saying that women were now being hired. These women were among the elite of the town; they drove to the plant in luxury cars and wore beautiful clothes, but were willing to work on war-related jobs. The tests were used to identify areas on which the women had to be trained before they could be assigned to a job. It was amazing to us to find that many (perhaps most) of the women applicants could not read a ruler or scale. Identifying the areas where training was needed enabled the company to train and use women on many jobs on which only men had formerly been employed.

During the war, I had another experience which, while not exactly in the field of industrial psychology, gave me some very worthwhile experience in working with labor and management. Early in 1943, I took a leave of absence from Purdue to accept an appointment as Vice Chairman in charge of wage stabilization of the 6th Regional War Labor Board in Chicago. The unions had all made a "no strike for the duration" pledge and there were only a very few conditions under which the War Labor Board was permitted to allow a wage increase. One of these conditions was to correct wage inequities, e.g. when a company could show that some of its jobs were underpaid in comparison to other jobs in the plant. This policy resulted in the creation of a great deal of business for management consulting firms who installed job evaluation systems. Many companies that had never heard of formal job evaluation before the war quickly got on the "band wagon" and with the help of the consulting firms (for a fee)

installed job evaluation systems. Usually this permitted them to raise some wages and also reduce worker complaints.

In addition to wage matters, the War Labor Board handled a large number of disputes on other issues. These issues often involved agreeing on the content of a new labor-management agreement, known as the contract. These were continuations of collective bargaining sessions between a company and the certified unions. When no agreement was reached, the dispute was heard by a joint panel of the War Labor Board, consisting of a labor representative, an industry representative, and a neutral member of the Board. When the session, which often took several days, was over, the panel recommended to the Board what clauses the contract should contain. After sitting on several such panels as the public member, I decided to join the American Arbitration Association so I could hear and decide grievances that had gone to arbitration. The typical arbitration clause in a union-management agreement provides that when a grievance goes to arbitration, the decision of the arbitrator is final and binding on both parties.

I heard some very interesting cases as the arbitrator of some of these disputes. One involved a company that was operating a new plant for the construction of fighter planes. When the operation was getting under way, the company assigned journeymen machinists to some of the riveting jobs. After the procedures were well standardized it became apparent that relatively untrained girls could handle this job, and the company began to assign girls to the job. The machinists who were assigned back to work requiring their machinists' skills filed a grievance stating that they wanted to remain in the "unskilled" job to which they had previously been assigned (and on which they were being paid at skilled rates.) As the arbitrator, this seemed unreasonable to me and I gave the decision to the company. After serving as the arbitrator in several grievance disputes, I developed a "feel" for the kinds of decisions that had to be made to give an even break to both parties.

After the war, I took part in the case of a large telephone company that wanted to inaugurate what they called an expanded area service. This would enable telephone subscribers in small towns adjacent to a city to make long distance calls to the city without paying a long distance toll charge. This service, it was thought, would be helpful to the businesses in the city as well as to the rural subscribers. However, the service would require a slight increase in the monthly phone bill of the subscribers, so the company wanted to get customer reaction before putting the plan into operation. The first step they took was to send out a short description of the plan to all subscribers in a certain middle-sized city with a return self-addressed postcard for a reply for or against the plan. Since the plan would have involved a slight increase in the monthly rate, the postcards returned were overwhelmingly against it.

The company officials then came to me for suggestions on how they might proceed. I suggested that they develop a very carefully prepared packet of information on the plan and then have carefully trained telephone company employees personally interview a random sample of subscribers, explain the plan in detail to each one, and then take a vote of for or against the plan. The interview explanation included information about the increase in rate that would be required. The company decided to try this method. Using a table of random numbers, we picked a sample stratified by age, business, and amount of previous telephone bills.

Surveys of this sort were conducted in five cities and were showed the percents of subscribers in favor of the plan to be 91%, 81%, 85%, 85%, and 88%. The analysis revealed that with the size of

samples used in these five surveys, there were 99 chances in 100 that if all the subscribers had been interviewed in each city, 60% or more of them would have been in favor of the plan.

These results were presented to the Public Service Commissioner and he gave his approval for the company to inaugurate the plan. This was done in each of the areas and it has worked out very well. The investigation and the experience of presenting the results to a state official, who knew nothing about random sampling, was a very interested and worthwhile experience.

Another interesting consulting job I had for several years were serving as a consultant to the A. C. Nielsen Company. Everyone knows about the Nielsen ratings as the life or death of TV shows. But not so many people know that the major source of the company's profit is not the TV ratings but their Retail Index Services. These services involve sending a field man into a random sample of stores over the entire country. These field men determine what products have been sold during a certain time period; these data are sent to the central office where they are analyzed and summarized for presentation to the companies that subscribe to the service. Several times each year a Nielsen Client Service Executive meets with the client companies and shows them in a graphic and quantitative manner how their products are selling in comparison with all competing products. This service has been very well received by many companies.

My work with the Nielsen Company consisted of giving a battery of tests to field men to help in identifying men who could be promoted to higher-level jobs, particularly into the position of Client Service Executive. Since at that time the company employed over 400 field men, my work involved testing these men at various locations where they assembled in groups of ten to fifteen at a time.

After the group testing, I conducted a private patterned interview with each man to evaluate their feelings about a possible promotion to a Client Service position. On the basis of the test results and the interview appraisal I prepared a report to the company in which I recommended what action on the man might be considered. As a result of this program, no promising field man ever got lost in the field, and it was the source of many very good Client Service Executives. Working with the Nielsen organization in this capacity for several years was a very satisfying experience.

Another area in which I did considerable work in the 40's and 50's was personnel or biographical data in relation to job success or tenure on the job. This approach often resulted in an effective hiring procedure for jobs for which there were no suitable personnel tests. The following case history is an example of this approach. One day the personnel director of a very large laundry in southern Indiana called me on the phone and asked if we had a personnel test that could help in selecting pressers who would stay a reasonable length of time on the job. He said that many, if not most, of the women they hired quit in less than three months, which was before the cost of hiring and training had been recovered. I told him that I did not know of any test for pressures but I would come down and discuss the matter with him. I drove down to the laundry the next day and while driving down I had an idea. When I got there, I asked him if he had personnel data in the form of height, weight, and age of the pressers he had recently hired. Fortunately, he had such data on file. We then proceeded to do a little arithmetic and obtained the following results. We compared data for a group of pressers who quit before three months (the quitters) with another group who were still on the job six months or more after employment (the stayers). We found that the quitters were 5'3 " tall and the stayers were only 5' " tall. On weight, the quitters weighed 123 lbs. and the stayers 145 lbs. On age, the quitters when hired were 25 years old on average and the stayers were 29 years old. The pattern was very clear. The typical

quitter was taller, lighter, and younger than the typical stayer. This personnel director had too often been hiring the younger, more attractive girls (who tended to quit very soon) and avoiding the older, less attractive women who, if hired, would have stayed longer on the job. He still did not have a personnel test for pressers, but with this analysis of personnel data he was able to improve his hiring practice a great deal and the organization profited from this analysis of personnel data. Data of this sort are obviously very situational. They apply only for the particular time, job, and place that was studied. A personnel man needs to make a continuous study of such data so he will not make the mistake of using a pattern of personnel data that may no longer be valid. But by doing so, he can usually maintain an effective hiring procedure even when conditions change in his employment market.

Some time before, I had conducted a similar study with lens polishers at the Bausch and Lomb Optical Company. In this study we found that the company should hire men for this job who are married, have dependents, have less than a high school education, are over 22 years old, and are under 6 feet tall. Here again, we had not test for lens polishers, but the pattern of personnel data developed by the study solved the problem of hiring men who would stay on the job.

From 1946 to 1971, Dr. C. H. Lawshe and I conducted an annual Personnel Testing Institute in which we showed personnel men how personnel tests should be properly used. Using a large sample of published tests, we covered in detail just what traits, abilities, and skills can (and cannot) be measured with presently available tests. Characteristics that can be measured included mental abilities (intelligence), typing and shorthand skills, knowledge of machine tools, knowledge of electricity, arithmetic, and scale and blueprint reading. Personality traits were given as examples of characteristics that cannot be accurately measured with presently available tests¹.

¹Editor's footnote: I/O psychologists have widely varying opinions on this point. Some studies, e.g., Sears, Roebuck report success in predicting managerial promotions.

Using the project method and specially printed forms, we showed exactly how to validate a test for a particular purpose, i.e., selection or upgrading. We discussed confidence levels and showed the participants exactly how to determine how much confidence could be placed in the results of a project.

During the 25 years of this Institute, we had 885 personnel men (and women) attend the session. We have felt very strongly that if companies had followed validation procedures which were objective in character, such as coded job samples, production records, accidents, and tenure, which we recommended, they would not now be having the troubles with government agencies that have developed since the passage of the Civil Rights Act of 1964.

Since my retirement in 1971, the only professional work I have done is to work with a few companies in giving tests to present employees who would like to be upgraded into jobs such as a set-up man or an apprentice in machine tools or maintenance. The tests I use cover the things that a man on these jobs has to know to handle the job in a satisfactory way. These include such knowledges as arithmetic, fractions and decimals, reading a working drawing, and in the case of machine tool apprentices, knowledge of machine tools, and for maintenance men, knowledge of electricity. In other words, the tests I am using all have what is known as "content validity," i.e., they all measure things that the job requires.

My experience in the field of industrial psychology which, as pointed out earlier, I got into somewhat by chance 40 years ago, has been very rewarding. Around 100 graduate students have taken advanced degrees under my direction. To mention but a few, they include C. H. Lawshe, W. E. Scott, Darwin Winick, Ray Schucker, John J. McNamara, William Chew, and Samuel Stevens, Jr. These men (and a few women) all have responsible positions with major companies. Industrial psychology has come to be accepted and respected in the industrial world, and this I am very happy to see.