

Complexity and Psychological Functioning across Life, Work, Culture and Disciplines

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### ABSTRACT

This paper begins by describing the pathways that led me to a two-discipline research career; psychology and sociological social psychology. I describe the unusual number of my family members who have a PhD in psychology and conduct psychological research, and additional family members, who provide psychological therapies. My own psychology research addresses schizophrenia, aging and cross-cultural psychology.

The central sociological research reported is based on extensive interviews of population-based samples. It examines the reciprocal effects, across the adult lifespan, between environmental complexity and psychological functioning. A key finding is that greater complexity of occupational conditions is related to higher intellectual functioning and holding self-directed values and orientations. These population-based studies extend to cross-national comparisons which suggest that these relationships hold across such seemingly diverse cultures as the United States and Japan but may not hold under conditions of very great national stress such as Mali and probably Ukraine.



### Introduction:

In this article, as I did in my oral presentation at the 2016 ASA convention, before presenting mine and my collaborators findings, I would like to describe: 1) the uniqueness of my family's professional background as psychologists- nearly all of the close ones of the research kind, 2) my own career as a research psychologist, and 3) how I came to the NIMH Laboratory of Socio-environmental Studies (LSES), my colleagues and the research conducted there- particularly what was done with my varying levels of collaboration. This personal and professional background is relevant because in my role as a sociologist, my wide research psychology background has colored and continues to color the questions I ask, the variables I examine and the explanations I help arrive at.

### My Professional Background:

There may be another, but I suspect that I am the only person who has received the Cooley Mead Award who is also a Fellow of the Association for Psychological Science

or who has authored papers with titles such as “Autonomic correlates of sensation seeking and monoamine oxidase activity” (Zahn et al, 1986) or “A time course analysis of Stroop interference and facilitation: comparing normal individuals and individuals with schizophrenia.”(Schooler, Roberts, and Cohen, 2008) or Context, Complexity and Cognitive Processing in Schizophrenia (Schooler, Newman and Caplan, 1997). I am also probably the only awardee who has never held even a tenure-track position at a university.

I am almost certainly the only person whose eventual choice of career, in my case going into social psychology rather than philosophy, was settled by a coin toss. In 1954, when I was a senior at Hamilton College, after my application to the Harvard Social Relations Department was firmly rejected, quite possibly because I was in about the 28<sup>th</sup> GSAT percentile in math, my advisor at Hamilton told me that I had won a graduate fellowship in philosophy at Brown University. By then I was also very seriously considering applying to the Social Psychology program in the Psychology Department at NYU where my uncle, Isidor Chein, was a Professor of Social Psychology- more on psychologists in the family later. I decided to make my choice with a coin toss: heads- NYU Social Psychology; tails- Brown University Philosophy. When the coin landed on heads I found that I was greatly relieved. I applied to NYU and was accepted. Since then I have recommended the coin toss method as a way a way of clarifying which of two choices one actually prefers.

At the end of my second year at NYU I was offered and accepted a position as a social psychology trainee in a Veterans Administration (VA) psychiatric hospital where, with

Herbert Spohn as the lead investigator, we conducted a study that compared a control ward with an experimental ward in which treatment emphasized the importance of increasing social contacts and strengthening social relationships. More than 20 years later I was responsible for finally publishing the results that showed conclusively that those in the control ward fared better than those in the experimental ward (Schooler and Spohn 1982). As a result of this experience, throughout most of my career I continued to do research on schizophrenia at levels ranging from the biological, through the psychological, to the social. Although I believe that some of these papers were pretty good, and some were even reasonably well cited, it would be fair to say that at the basic levels of causation, schizophrenia “won.” The understanding of the contributions of genetic, pathophysiological, psychological, environmental and social factors of this complex illness still represent a great challenge. However, my continuing interest in psychopathology provided the impetus to consider multiple levels of causation in understanding human behavior and is reflected in my sociological social psychology research.

While planning my third year of graduate school, my advisor at NYU, Marie Jahoda, the former wife of noted Columbia sociologist Paul Lazarsfeld, suggested that, without seeking permission from the NYU faculty, I sign up for Robert Merton’s core course on sociological thought and theory whose organization and contents were never as systematically presented in his writings as in his classroom lectures at Columbia. About 40 years later, I was very pleased to indirectly learn that Merton, one of the very few professors that I was ever awed by, was quite approving of a paper I wrote for a special

issue of *Social Psychology Quarterly* (Schooler 1994) on sociological theorizing. The core of my paper was a formalized description of Merton's theorizing as presented in his classroom lectures as well as some relatively minor theoretical and practical extensions dealing with some of the various types of research on which I have spent in my career as a sociological social psychologist. I have to say that when I learned second hand that Merton enjoyed reading the article and its presentation of his ideas, I was very, very pleased.

As I have already noted, throughout my career, besides working and publishing in *Sociology* and *Sociological Social Psychology*, I have continued to function as a research psychologist and to publish in sub-disciplines of psychology ranging from biological, through aging, clinical and social to cross-cultural. For example in aging: "Use it-and keep it longer, probably. A reply to Salthouse" (2007)".

The possibility of the influence of genetic inheritance on intellectual interests and occupational choice is dramatically illustrated by my family. I am far from the only psychologist in the family. As noted above, my mother's brother, Isidor Chein, was a prominent psychological social psychologist. In 2016, his grandson and mine maintained a family tradition by having dinner together at the annual Psychonomic Society meeting. Some form of assortative mating may also be involved.<sup>1</sup> My wife Nina is probably the leading psychologist researcher on evaluating pharmacological and behavior based treatments for schizophrenia. Both of my sons, Jonathan and Lael, are leading researchers in their respective fields of psychology. Jonathan's ex-wife and Lael's wife are both PhD psychologists. Jonathan's son Joel is in the PhD program at the University of California,

Santa Cruz- investigating computer-human interaction. Our three remaining grandchildren-granddaughters- are still in high school or early college career. Two in the past have expressed a definite interest in not following the family 'tradition'; but, recently it seems that the final score is not yet in. None of the Americans actively treats people. My only sibling, my sister Miriam Bendicksen, lives and late husband lived in Norway. As a psychologist, she diagnoses and treats people, as did her husband and as does one of her two sons.

If a picture is worth some large number of words there are two pictures that were taken 18 years ago during the celebration of my mother's 90<sup>th</sup> birthday. The first picture

Figure 1 about here

shows all those family members, by blood or marriage, in attendance who were Ph.D. psychologists of one kind or another. The second picture adds other family members and

Figure 2 about here

spouses involved in scientific psychological investigation and professionals like social workers who provide psychological services. The "link" between my family and professional interest in some form of psychology may conceivably be chance, but I would bet against it. What I cannot satisfactorily do is come up with an explanation; "we are all a bit crazy" is not it. Is there some sort of 'psychology gene', gene combination or epigenetic phenomena that lead us to focus on understanding thought and behavior?

Furthermore, there seem to have been things about the environment that were conducive, especially to those somehow prone to think about such things, to cause some

to wonder why people end up thinking the way they think and doing what they do. I distinctly remember when I was in the fourth grade having a conversation with my best friend at the time about what made the different people in the neighborhood and in different neighborhoods do and apparently think in the somewhat different ways that they do. My friend said he wanted to be a nuclear physicist, as was one of his relatives. Ironically, my friend was admitted to the Harvard Social Relations Department where he began as a sociologist but ended up as an experimental psychologist who is both extraordinarily respected for his own very thoughtful and careful work and as a major leader and teacher in the field.

I have gone through what I have just said to provide some personal background for my career as a sociological social psychologist. What follows describes how it historically came about (I am probably old enough to use the adjective) and what happened.

### My Career

How I came to the LSES at the National Institute of Mental Health(NIMH) in 1959, where I would spend the next 50 years, was actually a function of what may be the last true collaboration between psychological and sociological social psychology- the World War II American Soldier Project. In the late 1950's for a healthy American male who was finishing his education there were only two options for avoiding being drafted into the military: become a parent or volunteer in a military service- among which was the Public Health Service (which later during the Vietnam war became known as the "Yellow Berets"). Since there was no guarantee that parenthood could be achieved in

time (it was-hence Jonathan) the Public Health Service and the NIMH provided an option for me. The noted social psychologist M Brewster Smith, who at the time was the executive chair of the NYU social psychology department, had served with John Clausen, then head of the NIMH LSES, while working on the now historic, militarily sponsored American Soldier project. John Clausen, was, at the time, under great pressure to have his Laboratory carry out studies at St. Elizabeths, the District of Columbia's psychiatric hospital. And my experience in the VA fit his needs. Brewster and John spoke and I was immediately hired. Many years later, I learned that I was the only member of the LSES who was hired without having given a talk to the Lab as a whole or been interviewed by its members.

During my half century long stay in the LSES (it was later changed to a Section because the then head of NIMH did not believe in the relevance of such research) I was involved with four very major researchers, each of whom was interested, in his own way, in in the effect of socioenvironmental conditions on human psychological functioning. The four were the social anthropologist William Caudill and the to-become-distinguished sociologists Leonard Pearlin, Morris Rosenberg and Melvin Kohn. The synergy of these collaborations resonates to this day in both their and my careers.

Bill Caudill was a social-anthropologist famous in 1961 for research in which he had had himself admitted to a private mental hospital and who as an anthropologist described the patient experience (Caudill 1952). His most famous research during his time at LSES was on Japanese mother-child relationships. After his premature

death in 1972, I had the responsibility of finishing and publishing articles based on his meticulous anthropological observations of mother-child interactions and his views of Japanese culture and society. My first fellowship to Japan in 1971 was sponsored by the Japanese government for scientists under the age of 40. Bill may well have contributed to the success of my application, but his introduction to the Japanese NIMH Laboratory of Socioenvironmental Studies where I was based and to many other social scientists and psychiatrists was key. That initial appointment, together with Bill's backing and contacts, permitted me to initiate and continue a life-long professional interest in Japanese psychological functioning, and my more personal interest in Japanese aesthetics and Buddhist philosophy.

Len Pearlin would become a leading figure in the sociological theory and research of psychological distress and coping. My relationship to Len was more as a data analyst and clarifier than of a full collaborator. After our joint inability to come up with a research project at St. Elizabeths Hospital, Len developed an interest and then a study of coping behavior- the first step in the development of what was to be his sociologically oriented theory of psychological distress. We did, however, maintain a tradition of playing an occasional lunchtime handball or racquetball game at the local Jewish Community Center. It was while driving together for one of these games that Len mentioned to me that he seemed to have some meaningful findings about coping behavior but that he could not figure out a kosher (my word) way to formally conceptualize and more importantly analyze the data so that what seemed to be the case could be published.

The resultant paper- The Structure of Coping (Pearlin and Schooler 1978 Journal of Health and Social Behavior) for which my contribution was relatively minimal, has become by far the most cited paper of my career perhaps because measurement of coping strategies is relevant to a wide range of scientific inquiry. It opened his path to the development of his widely recognized theory of life course and stress processes (Pearlin 2010).

My collaboration with Morris (Manny) Rosenberg occurred late in his career. Manny's sociological theory of self-esteem and the rating scale that accompanied the theory have become the benchmark for the study of self-esteem in many disciplines world-wide (Rosenberg 1965), (Yoo et al 2015.) I convinced him that it would be scientifically worthwhile to reanalyze his wealth of data on self-esteem using structural equation modeling. What we found was essentially strong but more nuanced support for Manny's hypotheses about the determinants of self-esteem (Rosenberg, Schooler and Schoenbach 1989).

John Clausen left the LSES about a year after I arrived and Mel Kohn was appointed Lab Chief- by far then the youngest in the NIMH intramural program. It is close to impossible to separate my role from Mel Kohn's in much of the initial parts of the research program that I will be describing. Our first discussions for these studies began with the consideration of Kohn's earlier cross-sectional study of parental values and their link to social class (Kohn 1959). In that study, he found a close fit between life conditions and demands of working and middle class parents and the values they

espoused for their children. For working class parents respectability was deemed important and problematic; for middle class parents it was internalized standards of conduct.

In contrast to my collaborations with Leonard Pearlin and Morris Rosenberg, in developing, planning and carrying out our joint studies Mel Kohn and I were essentially equal contributors. Many of our approaches were so jointly and collaboratively developed that it is often impossible to say who thought of or contributed what. In planning the original longitudinal study, I was a bit pushier on the concept of carrying out a longitudinal study that broadened the range of the psychological and environmental variables. Mel was a bit more concerned that what we included in our survey provided the possibility of more carefully testing the conclusions of his earlier cross-sectional research on parental values. I was a bit more concerned about the generalizations that could be drawn. But we both shared the view that the research must involve US population based sampling.

A theme that runs through all of this research is the relationship between environmental complexity and psychological functioning particularly, but not only, in terms of occupational conditions. Central to this research, but not its sole concern, are the relationships between environmental complexity and levels of both intellectual functioning and self-directed orientations. The background is my long-term empirically based philosophical/psychological interest in the interrelationships among different levels of processes/phenomena. Briefly stated, human beings exist in and are the results of

different levels of emergent processes/phenomena: sub-atomic, atomic, physical, biological, psychological, social structural and cultural. Each level of phenomena is in a sense dependent on the relevant state of 'lower' levels. In some cases, "higher" levels of phenomena can also affect the state and nature of the lower levels (the philosopher in me survives).

A personally absent influence on how this research was analyzed was Herbert Simon, the subsequent Nobel Prize winner in Economics, who was in the 1970s briefly passing through sociology en route from economics to cognitive psychology. Simon, having seen an early-unpublished version of a paper we had written on the first wave of interviews, wrote us a short note. In it he suggested that our reciprocal effects modeling was statistically wrong and that we should look into something called Structural Equation Modeling. Thus, Mel and I embarked on a search that found us at the Federal Reserve Board where we were eventually led to a deep basement office occupied by statistical types, many wearing T-shirts and sandals, who told us about structural equation modeling and the correct way to model reciprocal effects. Mel and I developed and continued to use our skill in such statistical modeling over the upcoming decades and were among the leaders in introducing the method as a working statistical tool to sociology and its adjacent social science fields.

The first wave of the occupation study was based on a sample of 3101 randomly selected employed men in 1964. Please note that we interviewed only men in the first wave and that the sample of 3101 was remarkably large. Mel and I developed the long

and extensive questionnaire.

Further waves of the US occupation study involved two longitudinal extensions in 1974 and 1994. The first continued my collaboration with Mel. In 1974 the number of male respondents was randomly reduced to 697 men. Also interviewed were 555 of their wives, of whom 269 were working. Finally, in 1994, with interest and funding from the National Institute of Aging, and with new collaborators- Gary Oates and Mesfin Mulatu- the third and final wave of this longitudinal effort was completed.

### Reciprocal Effects of Environmental Complexity and Psychological Functioning in the US

I will now turn to providing my understanding of what has been learned from this endeavor in the US. The initial decision to sample only employed men would be unseemly today. In the early 1960's we reckoned that we needed a sample of about 3000 in order to be able to test our hypotheses regarding employment. We reasoned that most men would be employed and that employed women represented a complex extension that would not increase our ability to test our primary hypotheses about the relationship of the nature of employment to intellectual functioning and self-directed orientations. In 1974, given our initial sampling frame, we rectified that limitation by including the wives of the randomly selected 687 employed men. This extension was made possible within available financial resources because our improved statistical methods allowed us to sample 687 of the original 3101 men and add their wives. Today, obviously, we would make a very different decision and sample men and women regardless of employment

status. Although it is important to state these limitations, our findings do generalize to working men over their life span and to their spouses. Do they generalize further? Quite probably, but not necessarily.

Central to the findings across all three waves are three concepts: (1) environmental complexity (2) effective intellectual functioning (also called ideational flexibility—a series of analyses in 1994 showed that this measure correlated .87 with standard IQ measures) and (3) self-directed orientation to work. Environmental complexity is defined as an environment in which the individual (1) is called on to make decisions on the basis of a wide variety of factors, (2) is exposed to numerous alternate models of behavior, and (3) can see as plausible a wide range of goals (Schooler AJS 1972). Ideational flexibility (also called Intellectual Functioning) was indexed by measures of cognitive performance during the interview that required weighing both sides of an economic or social issue, propensity to agree and the interviewer's judgment of intelligence. Self-direction of work was indexed by complexity of work with things/data/people, closeness of supervision and repetitiveness.

The first series of papers, based on the 1964 wave were, of course, cross sectional. In Kohn and Schooler (1969) we examined the relationship of occupation and education to psychological functioning in the context of social class. Occupational self-direction emerged as the most important occupational condition in these initial analyses and would remain so. The findings reported in this early non-longitudinal paper indicated that what came to be called occupational self-direction (i.e., work that involved relatively high

levels of intellectual functioning and low levels of direct supervisory control) was positively correlated with indices of psychological functioning including: 1) intellectual functioning, 2) personal values of self direction 3) social orientations such as being less authoritarian and more open to change, and self concepts including greater self confidence and less anxiety. These findings were limited by the cross-sectional nature of the study.

Broadening the idea of occupational self-direction led to a concept that would remain central to all three waves: environmental complexity. Environmental complexity served as the explanatory principle in a paper based on the first wave of data collection that focuses on measures outside the realm of occupational functioning. I found that more complex environmental conditions, i.e. e. being in a younger cohort, having a father with a higher education, being raised in an urban environment further from the “Old South” and in a relatively less fundamentalist Christian religion led to being less tolerant of external constraints, more concerned with their own internal lives and higher levels of intellectual functioning (Schooler 1972).

In another paper (Schooler AJS 1976) I tested the possible existence of a cross-generational effect on potentially relevant psychological variables of a variable that could be readily linked historically to environmental complexity- the date at which serfdom was eliminated in the European countries from which the respondent descended. The paper was titled Serfdom’s Legacy. The ranking of countries from earliest to latest is Scandinavia; England, Ireland, Germany, South and Central Italy, Eastern Europe. The

analysis was restricted to the 930 gentile men whose ethnic -group origin in terms of these European countries could be established. The psychological orientations examined included intellectual flexibility, intellectually demanding use of leisure time, non-authoritarian conservatism, self-directed parental values, personally responsible morality, sense of control over one's fate and non-self-deprecation. Each of these was strongly correlated with temporal distance from serfdom. These correlations held controlling for social class, occupational self-direction and the five variables that indexed environmental complexity used in the paper discussed above. The correlations were even stronger if positive ethnic identification was included in the model.

For the second wave of data collection we attempted to contact a random sample (883) of the initial study cohort who were still under 65 years of age and succeeded in interviewing 687, 88% of the men located and still alive and (555) of their wives. This wave allowed for true longitudinal analyses for the men and permitted the possibility of a future wave that could provide longitudinal data for both the men and and their wives that we also interviewed in 1974. We benefitted both from the availability of longitudinal data for the men and the full development of structural equation modelling statistical methods. We extended the exploratory factor analytic models to confirmatory factor analyses involving our key concepts - ideational flexibility (AKA intellectual functioning), self-direction of work and environmental complexity. Thus, we were then able to examine the longitudinal and cross-lagged effects of the relationship of personality and work.

In 1982 Mel Kohn and I published *Job Conditions and Personality: A Longitudinal Assessment of Their Reciprocal Effects* (Kohn and Schooler 1982). Using the longitudinal data that we had gathered, we simultaneously considered several structural imperatives of the job and major dimensions of personality- intellectual functioning, self directed orientations to self and society and a sense of distress. The analyses demonstrated that the structural imperatives of the job affect personality: self-directed work leads to: 1) a higher level of intellectual functioning and 2) a self-directed orientation to self and society. Oppressive working conditions lead to distress. These findings can be seen as strongly supporting a learning generalization model. The individual's psychological characteristics, in turn, had important consequences for an individual's place in the job structure and in the system of social stratification. In particular, both higher intellectual functioning and a self-directed orientation tend to lead over time to more self-directed jobs.

The interview for the third and final wave in 1994 permitted the deepest examination of the relationship of work and personality and allowed us to extend our reach to functioning that went well beyond work and effects in older men and women who were beyond their working lives.

First, a few words about our success in interviewing the respondents- the men 30 years after first contact and the women 20. We succeeded in locating 650 (95%) of the households that took part in the '74 survey. The 1994 wave benefited from available technologies that included our ability to use existing information from the prior round of

interviews to locate individuals even if they had moved. More importantly, in contrast to contemporary responses to surveys, since the respondents apparently ‘enjoyed’ the experience of the previous interviews they generally willingly agreed to participate in this final one. Unfortunately, since the more recent multiplication of “surveys” that essentially function as sales or money collections, it has become much more difficult to get a putative “unbiased” random sample.

244 individuals (168 men and 78 women who were still working) were the subjects of our first set of analyses. In these analyses, based on those who were still working at the time of the third wave, we found that the earlier findings that self directed occupational conditions increase intellectual functioning and self directed orientations still hold when the respondents are 20 years older. These results confirm that even late in life self-directed work conditions continue to positively affect these psychological characteristics. The pattern of changes in these psychological characteristics, in turn, affects social structural characteristics in ways that increase disparities between the advantaged and the disadvantaged (Schooler, Mulatu and Oates 1999, Schooler and Mulatu 2004).

A second set of analyses included all respondents and allowed evaluation of the effects of environmental complexity on intellectual functioning in older people (Schooler, Mulatu and Oates 2004, Schooler 2008). The results provided clear evidence that the substantive complexity of paid work as well as of leisure time activities of middle aged and older adults affects their intellectual functioning. Doing more complex work or leisure activities increases intellectual functioning: doing less complex work or leisure

time activities decreases intellectual functioning. This causal pattern holds true when we compare the effects of complex paid work on older and younger workers and also of complex leisure time activities on older and younger individuals. We have also found evidence that the reciprocal effect - which many would have expected - exists. Having higher levels of intellectual functioning leads people to carry out more complex paid work and engage in more complex leisure time activities.

#### Cross-cultural Studies Probe Generalizability

An important question is whether the findings from the longitudinal studies already presented generalize beyond the United States. Replications and extensions of the longitudinal US studies were carried out in Poland, the Ukraine, Japan and later Mali. Mel was the principal American researcher in the Polish and Ukraine studies; I was the principal American researcher in the Japanese and Malian ones. Initially we chose two countries in which to examine this question; Poland and Japan. The choice was motivated by the mutual interests, expertise and personal connections; Mel's to Poland and mine to Japan. The results of these longitudinal studies in Japan (Naoui and Schooler 1985) and Poland (Slomzinski, Miller and Kohn 1981) indicate that over time occupational self-direction and/or complexity of work lead to increased intellectual functioning and more self-directed orientations. Conversely, occupations with lower levels of self-direction and work complexity lead to less self-directed orientation and reduced intellectual functioning.

A recent paper, 'Social Change and Psychological Change in Rural Mali' has the distinction of having been rejected by a goodly number of the reasonably well known

journals in the fields of sociology, psychology and cross-cultural research; it was eventually published in the Journal of Asian and African Studies (Schooler, Caplan, Mounkoro and Diakite 2016). The paper uses data from a two-wave longitudinal study conducted in Mali, a West African francophone country. It has two distinct parts. In the first we compared the over-time correlations for both men and women of four psychological factors- 1) Anxiety-Depression, 2) Self-Confidence, 3) Fatalism vs Mastery, and 4) Authoritarianism in five countries. We had responses from interviews conducted 20 years apart in the US, four years apart in Poland, 24 years apart in Japan, 4 years apart in Ukraine and 6 years apart in Mali. Since life-conditions had apparently become distinctly more stressful in Mali and also in the Ukraine during a brief time than they had become over longer periods of time in the other countries it seems quite plausible to expect that greatly increasing the spread and intensity of stressful life conditions should decrease the over-time stability of the individual's psychological functioning. The time frames for re-interview vary substantially. Furthermore, we do not have Fatalism/Mastery scores for Poland, Japan and Ukraine.

In the three countries that we identified as having relatively less stressful life conditions between the two interviews- the US, Poland, and Japan- we see relatively high over time correlations – Authoritarianism .57 to .83. In the two countries that experienced highly stressful life conditions between the two waves of interview – Ukraine and Mali - we see strikingly low correlations between the two interview waves. The combined correlations for men and women for Authoritarianism are .28 for Ukraine and .10 in Mali. For a psychological variable that can be more directly linked to

psychological discomfort and illness -Anxiety/Depression- we see correlations in the range of .30 to .63 in the politically and economically more stable countries – the US, Poland and Japan and .01 in Mali and .27 in Ukraine. countries where the conditions of life became distinctly more stressful between interview waves.

A combined analysis of the countries identified as stable over time, the US and Japan, allows a further examination of how social structure and culture affect individuals' psychological functioning. These are countries with social structures and cultures that differ quite dramatically historically. However, as their social structures and cultures have become more similar under present day socio-economic and cultural conditions, the nature and strength of how they affect the individuals' psychological functioning appears to have become remarkably similar. In fact, multi-group structural equation modeling (SEM) using comparable longitudinal data obtained from older employed US and Japanese men revealed that the reciprocal relationships between self-directed occupational conditions and both self-directed orientation and intellectual functioning are the same for older US and Japanese men (Fujiwara, Schooler and Kikkawa 2016 under review).

### Environmental Complexity and Psychological Functioning Across the Life Span

The concept of environmental complexity was introduced earlier in this article to frame the study of occupational conditions and psychological functioning. A Google search for environmental complexity in 2016 generated 728,000 results. Here, following

an integration of the work presented and a review of other literature (Schooler 1984) I address the definition and research related to it more broadly. The article appeared in *Intelligence*, a psychology journal. My definition refers to the complexity of an individual's environment based on both its stimulus and demand characteristics. "The more diverse the stimuli, the greater the number of decisions required, the greater the number of considerations to be taken into account in making these decisions and the more ill-defined and apparently contradictory the contingencies, the more complex the environment. "

The 1984 article, that was based partly on the LSES research, but also on research done by others, displayed the usefulness of the concept of environmental complexity in many research areas. For example, the effects of environmental complexity on infant cognitive function have been shown by Scarr-Salapatek and Williams (1973). They found that low birth weight infants born to impoverished mothers benefit substantially from a program that increases the visual, tactile and kinesthetic experiences in the hospital. And I can't resist noting that Sandra Scarr-Salapatek was my first research assistant at the LSES in 1959. In the elderly, Sherry Willis and her colleagues have conducted multiple experimental studies indicating that environmental manipulations that increase the complexity of environmental demands can affect fluid intelligence. Most recently they have demonstrated that cognitive training involving dealing with complex environments enhances daily functioning and cognitive abilities both at two and five years (Ball et al 2002, Willis et al 2006).

Animal studies also show the effects of environmental complexity, i.e. environmental enrichment, on behavior. For example, Joseph and Gallagher (1980) found that rats reared in a restricted environment developed a limited behavioral repertoire compared to those reared in an enriched environment. Specifically, the restricted rats' behavior was characterized by a tendency to over respond, perseveration in repetitious patterns of limited and circumscribed responding and a failure to habituate to novel stimuli. A recent review (Fox et al 2006) concluded that enriched environments for animals attenuates behavioral anxiety-type responses and endocrine responses when these animals are faced with both psychogenic and neurogenic stressors.

### Conclusions

The longitudinal research regarding the relationships between aspects of occupational functioning and psychological characteristics such as intellectual functioning, self-directed orientations and distress led to the larger over-arching concept of environmental complexity. There are two questions about the effects of this work in the 21<sup>st</sup> century. The first is methodological. The success of the three-wave occupation study depended on rigorous sampling of populations both in the United States and in the studies conducted in other countries. Is such sampling and scale of research possible today? The ability to conduct such studies today is, I believe, at best extremely limited. The results of the 2016 pre-election presidential polling in relation to the results of the presidential election speak for themselves. One possible cause for this is the propensity of political organization to disguise fund raising efforts as polls; others include the

frequency of polling by multiple organization which reduces the rate of response dramatically. Such actions mean that identifying a sample based on the U.S. census and then expecting a high rate of response by those identified would be improbable today. Other strategies that are widely used in sociological social psychology depend on recruitment of college students as subjects, crowd sourced on-line surveys or targeted surveys using apps like Survey Monkey. The generalizability of findings using these methods to a representative population is questionable.

The second question is whether the study of the effects of environmental complexity is viable in the 21<sup>st</sup> century. Here I am somewhat more optimistic. In human populations defined by willingness to be part of experimental treatment studies, the effects of changing environmental complexity can be studied. However, some further understanding of the relationship of environmental complexity to psychological functioning will require studies that recognize the sampling limitations and utilize statistical methods to attempt to overcome them.

In the beginning of both my ASA presentation and of this paper I wrote about what might be considered a chain of levels of phenomena and presented myself as a kind of self-questioning case history. Subsequently, I directly or indirectly dealt with causes and effects involving four of these levels - Biological, Psychological, Social Structural and Cultural.

The first question I raised was “Why are there so many psychologists in, or married into, my family? For starters, its a good and meaningful heuristic question,

especially for someone who has spent much of his professional career studying occupations both for what one “puts into them psychologically or otherwise” and for what one gets - good or bad- out of them –economically, psychologically and in social status. Nor can one rule out the very high probability that biological/genetic as well as psychological, social-structural and cultural factors are involved not only in terms of what one initially “puts into work “ but also what one “gets out of work, “ not only financially, but also psychologically and in terms of one’s place in the social-structural hierarchy. More complex environments, across a wide range of levels, lead to increased intellectual functioning more self-directed orientations, and a number of other strengths in individuals’ functioning. Increased distress, in contrast, is related to stressful life conditions. What I have described in the meat of this paper are how from a sociological social psychology perspective some of the statistically significant processes through which this bi-directional effect takes place.

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and Sho Fujihara. In relation to Japan, I should acknowledge that part of my interest in Japan stems from my long term interest in Buddhist thought, philosophy and aesthetics. I describe myself as a Darwinian, determinist, process-oriented, neo-Buddhist. My research in Mali could not have been conducted without the intense collaboration and participation of Chiaka Diakite and Pakuy (Pierre) Mounkoro. Finally, I am most gratefully thankful to my wife, Nina Schooler, for her help in putting appropriately together the final form of this paper's manuscript- and for much, much, much more.

## ENDNOTES

<sup>1</sup>Assortative mating is a mating pattern and a form of sexual selection in which individuals with similar phenotypes mate with one another more frequently than would be expected under a random mating pattern.

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