A Longitudinal Process Model of Multiple Identity Development

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I develop here a longitudinal process model of multiple identity development using a comparative psychobiographical study of two eminent scientists. This lengthier and earlier time span overlaps with but also represents a shift from current research. The protracted parallel trajectories of identity development imply a new overarching theme – an individual need for multiple identities. This novel perspective also suggests a critical, complementary role for various identity-proliferative factors (genetics, family, incomplete development through earlier stage crises) and relationship-inhibitive psychological traits (introversion, avoidant attachment) that extend developmental lags.

1. Introduction

In the management literature, researchers have represented identities as the various meanings attached to an individual by the self and by others (Ibarra & Barbulescu, 2010). Authors have claimed that all individuals possess multiple, even conflicting ways of conceptualizing themselves but differ in the way these are organized intrapsychically (Caza & Creary, 2016; Markus & Nurius, 1986; Stryker & Serpe, 1982; Tajfel & Turner, 1979). In addition, accounts and narratives have been deemed to be an important part of the arsenal of practices and strategies by which individuals craft and negotiate work identities (Ibarra & Barbulescu, 2010).

Recently, research on multiple identities has received significant attention (Caza & Creary, 2016; Caza, Moss & Vough, 2018; Creary, Caza & Roberts, 2015; Kang & Bodenhausen, 2015; Leavitt et al., 2012; Obudaru, 2012, 2017; Ramajaran, 2014). However, the recent focus upon, inter alia, how individuals manage contemporaneous multiple identities (Caza & Creary, 2016; Caza, Moss & Vough, 2018) and on how individuals adapt in single, sequential role transitions at work (Ibarra, 1999; Ibarra & Barbulescu, 2010), suggests shortcomings that study over a lengthier period might address. As an example, the question of how development in childhood, adolescence, and young adulthood may affect multiple identities at work remains open. Similarly, overarching themes that influence multiple identity development (e.g., needs, personality traits) over a longer period might emerge. In addition, the performance consequences of extended multiple identity development (e.g., time lags) remain relatively under-investigated. Thus, to shed more light on these issues, I report on a longitudinal, comparative psychobiographic study of two high-performing scientists here. Based upon my findings, I offer a longitudinal process model for multiple identity development in this article.

2. Literature Review

2.1 Multiple Identities and Single Sequential Role Transitions in the Management Literature

In the management literature, researchers have represented identities as the various meanings attached to an individual by the self and by others (Ibarra & Barbulescu, 2010). These meanings may be based on a person's social roles (social identities) or based upon personal, idiosyncratic characteristics (personal identities, Ashforth & Mael, 1989; Gecas, 1982, Ibarra & Barbulescu, 2010). Ibarra and Barbulescu (2010) contend that there is already shared agreement that identities are multiple, mutable, and socially constructed (Baumeister, 1998; Cooley, 1902; Goffman, 1959; Mead, 1934) but coexist within a self that integrates diverse experiences into a unity (Baumeister, 1998; Gecas, 1982; Markus & Wurf, 1987).

Within this literature, recent attention has focused upon the process of adaptation within a single role transition (provisional selves, Ibarra, 1999; cognitive tactics, Pratt et al., 2006, narrative elements in macro role transitions, Ibarra and Barbulescu, 2010). Alternatively, researchers have also studied how individuals manage concurrent roles. Caza and Creary (2016) emphasize identity structure/complexity (the degree to which identities are similar or overlapping) and offer five paradigms for managing increasingly complex structure. Caza, Moss & Vough (2018) examine authenticity problems and opportunities created by possessing multiple identities and propose building blocks that describe the process for plural careerists. In addition, Obudaru (2012, 2017) has recently suggested value in probing foregone identities. However, despite using retrospective accounts, even Obudaru (2017) suggests that a longitudinal study tracking people's experience from a career fork-in-the-road onward would be better suited to capturing how the process of forgoing professional identities unfolds over longer periods.

2.2 Incomplete Integration of Narrative Psychology into the Management Literature

Psychobiography, an inductive method, is an attempt to understand the psychological concepts underlying an individual's behavior through biographical evidence (Schultz, 2014). It emphasizes the virtues of historical, interpretive, and narrative methods as complements to quantitative and experimental methods (Runyan, 2005). The long tradition of psychobiography dates back to Freud (1910/1957) and, over the years, it has evolved, reappeared in different forms, and is actively growing in more recent decades (Runyan, 2005). In fact, according to Schultz (2005), psychobiographical works had appeared in some sixty-seven journal articles and fifteen books in 2001. Schultz (2014) claims that within the last twenty years, psychobiographies have become more programmatic and that some minimum standards have developed. However, it can also require the capacity for insight and the ingenuity to ask the right questions, the ones overlooked or seem wrongly as unpromising. He cites "excellent overviews" (Anderson, 2005; Elms, 2005; McAdams, 2005; Runyan, 2005) which are now available.

In the management literature, Ibarra and Barbulescu (2010) have suggested that accounts, narratives, and other rhetorical strategies form an important part of the arsenal for identity work (Ashforth, 2001; Scott & Lyman, 1968; Van Maanen, 1998; Weick, 1995). These authors stress story coherence via two primary narrative elements - plot structure and protagonist agency. Plot is a goal-directed sequence of

events relating the past to the present, and from that connection, one can extrapolate to the future (Gergen, 1994; Weick, 1995). Most plots typically pose a dilemma, a protagonist's journey to resolve that dilemma, and a turning point, climax, or catalytic event. Endings resolve the tension built up in the middle (Ibarra & Barbulescu, 2010). Through "emplotment" - the process by which narratives link temporal events by directing them toward a conclusion (Ricoeur, 1984) - idiosyncratic actions are woven into a meaningful whole (Polkinghorne, 1991).

Ibarra and Barbulescu (2010) also suggest that protagonist agency is a second important means of establishing narrative coherence. The protagonist provides the thread that ties together the meaning of the story's events (Pentland, 1999; Rimmon-Kenan, 1983). The protagonist's role is to account for any apparent discontinuity in the story. Alternatively, a protagonist may instead emphasize the personal values motivating an otherwise difficult to explain role change. Nevertheless, while plot and protagonist agency certainly contribute to narrative coherence, it is possible that other narrative characteristics (e.g., repetitive scenes and their constitutive elements; Raggatt, 2006; deep structure, Gregg, 1991) also add to a narrative's coherence. Thus, a second purpose of this report is to introduce and demonstrate the use of other relevant elements from narrative psychology into the management literature.

2.3 Augmentation of the Career Development Literature

I designed this study to contribute to process models of academic career development. It is well known that the productivity distribution of academic scientists is extremely skewed (Seglen, 1992) and studies have shown that the distributions can be well described by inverse power law functions (Coile, 1977; Pao, 1986). The presence of a skewed distribution seems consistent over time (Ruiz-Castillo & Costas, 2014). However, some explanations of the generative mechanisms focus upon characteristics of networks and are conducted the level of the university (node centrality, Burris, 2004; reciprocity, transitivity, and cumulative advantage, Bo, Liu & Gonzalez-Bailon, 2015). Thus, they do not pinpoint the role that individual differences such as personality or identity might play in the process.

A deviation-amplifying (Maruyama, 1963) process model of accumulative advantage (Merton, 1968; Allison, Krauze, & Long, 1982; Cole & Cole, 1973; Walberg & Tsai, 1983; Walberg & Stariha, 1992; Walberg & Arian, 1999) has also been enlisted to explain this skewed distribution. The model suggests that individuals trained in prestigious departments proceed on a path of spiraling success (Miller, Glick & Cardinal, 2005). Empirical results associated with the model suggest that the prestige or productivity of a student's PhD-granting department or doctoral supervisor is associated with the student's early publication success. In addition, both prestige and early publications independently determine the prestige of the student's first academic appointment. Subsequently, the prestige of that first appointment causes increased productivity of the young researcher. Finally, productivity ultimately leads to extrinsic and intrinsic career success (Bedeian et al., 2010; Cable & Murray, 1999; Judge et al., 2004; Miller et al., 2005; Williamson & Cable, 2003; Seibert et al., 2017). Once again, however, most of these studies are not conducted at the level of the individual and do not control for individual differences.

Nevertheless, some attention has been devoted to linking the privileged process with individual psychological constructs. For example, both proactive personality (Seibert, Kraimer, & Crant, 2001) and Extraversion (Seibert & Kraimer, 1999) have

been associated with outcomes of the process such as self-reported objective (salary, promotions) and subjective (career satisfaction) measures of career success. However, whether and how psychological constructs can explain many other parts of the process has received less attention. For example, whether psychological constructs can explain how and when individuals gain access to the privileged process in the first place remains largely unexplored.

There is some support in the literature for the notion that psychological variables can play a role in career development. Ketterson and Blustein (1997) implicate social learning (vicarious reinforcement, modeling, Krumboltz & Schroeder, 1965), self-esteem (Ellis & Taylor, 1983), career decision-making self-efficacy (Blustein, 1989), rational decision making (Blustein & Phillips, 1988), and attachment relationships (Ainsworth, 1989; Blustein, Walbridge, Friedlander, & Palladino, 1991; Hazan & Shaver, 1990; Ryan, Solberg, & Brown, 1996) in the process. In fact, secure attachment relationships have been associated with progress in career decision-making (Blustein et al., 1991), affirmative career self-efficacy beliefs (O'Brien, 1996; Ryan et al., 1996), and career planfulness (Kenny, 1990). Wright (2017) also found a negative relationship between avoidant attachment style and networking, job searching, and personal exploration self-efficacy.

Previous empirical work in psychology has suggested that attachment phenomena are relatively stable constructs (Fraley et al., 2011). Furthermore, researchers have found a positive relationship between different types of attachment (anxiety, avoidant) and different enduring personality facets. For example, avoidance is related not only to the depression aspect of Neuroticism, but to the low sociability and warmth of Introversion (low Extraversion), and the distrustfulness and uncooperativeness of low Agreeableness (Nofle & Shaver, 2006). As this study implements a longitudinal design, it enables some evaluation of the impact of trait-like psychological constructs (e.g., Big Five, trait attachment) on the career development process.

2.4 More Complex Notions of Technological Personal Identities

Finally, this study represents an in-depth investigation into a class of occupational identities distinguished by their link to technology. Some previous investigations have attempted to explore technological identities at the personal level. In fact, Roe (1953) and Mitroff (1974) investigated distinctions between experimental and theoretical physicists many years ago. More recent attempts to categorize scientists according to identities include star/non-star (Zucker and Darby, 1997; Roetharmel & Hess, 2007), academic/industrial (Dietz & Bozeman, 2005; Sauermann & Stephan, 2013), bridging/pure/inventor (Subramanian, 2012), Intrapreneurs/Researchers/Enablers/Bridgers (Bignon & Szajnfarder, 2015), and problem-solver/ solution-seeker (Lifshitz-Assaf, 2018). None, however, has posited the existence of multiple technological identities within the same individual, nor has any suggested parallel technological identity development within one individual. This study is the first to explore such concepts. Too, attention to the voice of the author (first-order data; Gioia, Corley, and Hamilton, 2013) may have uncovered a new technological identity, the “gadgeteer,” in the process.

3. Research Methodology

3.1 Inductive Methods

Inductive methods explicate processes and related “how” research questions extremely well (Eisenhardt, Graebner and Sonenshein, 2016). In this case, I have relied upon theoretical sampling. I selected the autobiographical materials of two eminent scientists to illuminate relationships among psychological and environmental influences early in the development of high-performing subjects (Eisenhardt & Graebner, 2007). The two subjects have much in common, which aids in eliminating or accounting for extraneous variation (e.g., Davis & Eisenhardt, 2011). Finally, the two clearly differ in important ways, which should bolster the robustness of the emergent theory (e.g., polar differences, Kellogg, 2012; Heinze & Weber, 2016). According to Eisenhardt et al. (2016), papers using inductive methods are among the most highly cited at AMJ (e.g., Dutton & Dukerich, 1991; Eisenhardt, 1989), and have been termed the “most interesting” (Bartunek, Rynes, & Ireland, 2006).

3.2 Narrative Psychobiography

McAdams (2001) suggests that people encode, store, and retrieve information pertaining to real-life events and personal experiences in autobiographical memory (e.g., Neisser & Winograd, 1988; Pillemer, 1998; Stein, Ornstein, Tversky, & Brainerd, 1997). Some autobiographical memories (self-defining memories, Singer, 1995; Singer & Salovey, 1993; personal event memories, Pillemer, 1998) constitute a subset of all autobiographical memories that occupy a privileged space in the individual’s life story. Evidence suggests that such memories can be veridical – accurate representations of the past – or biased reconstructions improvised to allow the person to assemble a plausible account of the past that functions primarily to maintain personal coherence (McAdams, 2001).

McAdams (2001) suggests that such self-defining memories can reflect central, psychologically significant patterns in life stories. They also may be self-defining in that they encode events that are emotionally intense and connected to important psychological issues (conflicts, fulfillment, or both). Moreover, scripts may encode self-defining memories (Tomkins, 1979) – events, associated emotions, and concomitant behaviors – which, if repeated over time, suggest story themes. For example, McAdams, 1982; McAdams, Hoffman, Mansfield, & Day, 1996; and Woike (1995; Woike et al., 1999) have conducted a series of studies demonstrating that individual differences in Thematic Apperception Test-based motives for power and intimacy are significantly related to content themes of agency and communion (Bakan, 1966) in people’s life stories.

3.3 Data Collection

Various methodologies that stress similar, sometimes overlapping aspects capturing the essence of episodic (autobiographical) memories (e.g., scripts, Tomkins, 1979; Demorest, Popovska and Dabova, 2012; personal event memories, Pillemer, 1998; minimum requirements, Schultz, 2014; Life Story Interview, McAdams, 2005) have been utilized in this study. In particular, I utilized McAdams Life Story Interview criteria and comparative psychobiography concepts from Isaacson (2005) to guide thematic analysis of the autobiographical materials studied here.

Primary data came from autobiographical books written by the two subjects (Frisch, 1979; Peierls, 1985). In addition, I used the American Institute of Physics documented interviews of Frisch (Kuhn, 1963; Weiner, 1968) and Peierls (Heilbron, 1963) as sources of data. Excerpts from these five sources underlie all of the observations stated in Section 4 (Findings) of this paper. The author of this paper also studied the scientific publications of Otto Frisch (he published 15 papers in the Journal *Nature* between 1932 and 1939, 12 as a first author) and some of the publications of Rudolf Peierls (Dalitz & Peierls, 1997).

Other books added perspective as well: the biographies of Lise Meitner (Sime, 1996), the biographies of other emigres in this age group (Leo Szilard, Lanouette & Szilard, 1992; Edward Teller, Rhodes, 1995) and books and papers on development of the atomic bomb (Hewlett & Anderson, 1962; Rose, 1998; Bernstein, 2010).

Finally, a book documenting a scientometric study on the social and cognitive position of German-speaking emigrants within the nuclear physics community (Fischer, 1993) provided much helpful data on the global development of the emerging discipline of nuclear physics from the period 1920-1947. It provided performance data on all such researchers, permitting the comparisons of performance cited later in this paper.

3.4 Data Analysis

I made efforts to conform to grounded theory guidelines (Glaser and Strauss, 1967; Strauss and Corbin, 1990; Charmaz, 2006). I worked iteratively between archival data, interviews, and autobiographies to identify similarities and differences across first-order codes, creating second-order, more theoretical categories. Third order, overarching themes developed in a similar manner.

4. Findings

4.1 Evidence of Comparable Performance and Developmental Lags

The Fischer (1993) scientometric study provides archival data suggesting that when compared to the citations of over 1000 publishing authors per year, the two eminent physicists ranked highly - 80th in 1935 (Peierls) and 105th in 1941 (Frisch). Furthermore, as the British government instituted a ban on publication of war-related material in 1940, it is likely that understatement of both rankings occurred during that year. Historians generally credit the Frisch-Peierls memo of 1940 with being the first to articulate a practical path to the atomic bomb (Gowing, 1964). Both researchers were heavily involved in war-related research.

Table 1 below, derived from the Fischer (1993) study, documents and compares their early professional development. I have drawn two key conclusions. First, both were able to work for “stars” for a significant portion of their early professional careers, an indicator that both had entered the accumulative advantage process early in their careers. However, while Peierls made this leap at the age of 19, Frisch appears to lag, as he achieved his first full-time appointment under a highly rated research (Stern) only at the age of 26, a lag of seven years.

Table 1 Career Development Comparison, Inception to Mid-Career

Rudolf Peierls				Otto Frisch			
Age	Supervisor	Role	Rank**	Age	Supervisor	Role	Rank**
19	Sommer Field	PhD student	9 th	20	Meitner***	PhD student	30 th
20	Heisenberg	PhD student	6 th	20	Przibam	PhD student	n.r.
21	Pauli	PhD student	47 th	22	Strauss	1 st job	n.r.
22	Pauli	1 st job	47 th	23	Muller	2 nd job	n.r.
25	Fermi	Fellowship*	2 nd	25	Pringsheim	3 rd job	n.r.
25	Fowler	Fellowship*	44 th	26	Stern	4 th job	41 st
26	Bragg	2 nd job	n.r. ****	29	Blackett	5 th job	34 th
28	Rutherford	3 rd job	3 rd	30	Bohr	6 th job	6 th
30	Oliphant	4 th job	23 rd	36	Oliphant	7 th job	23 th
				37	Chadwick	8 th job	4 th
<p>* Promising researchers received the annual Rockefeller Foundation Fellowship. The recommendation of a superior was an important criterion. ** The data in this Table are adapted from Fischer (1993). *** In the case of Lise Meitner, she was never a supervisor of Otto Frisch per se. However, her network was involved in Frisch's development (early jobs, recommendations) and she was intimately involved in his development as well, both directly and indirectly through her network. ****n.r. = not ranked</p>							

4.2 Data Structure (Second and Third Order Emergent Constructs)

Why the lag? I have utilized the data in the following tables to construct the longitudinal process model of identity development mentioned at the outset.

Table 2 Second Order Themes Derived from First Order Data

Second Order themes	Representative First order Data
BIRTH Genetics (heritable tendencies)	Unobservable but suggested by McAdams (2015), Roberts et al, (2008)
CHILDHOOD Seeds of productive multiple identities planted by family members (father, Grandfather)	<p>Father: "My father was a polyhistor (someone gifted or learned in multiple disciplines) ...He had a phenomenal memory and single-handedly produced, over a number of years, a sort of encyclopedia in installments. My father went to the University of Vienna and got the doctorate of law. After that, for a while, he earned a pleasant living by travelling in Italy and painting hotels...his love for Italy soon persuaded him to try for a second doctorate in the history of art."</p> <p>"(In Italy), whenever he saw a promising one (hotel) he would sit down and do an attractive water-color sketch. Soon a guest would appear and, after a while, the owner. When the owner duly admired the painting, my father would gladly present it to him and, over subsequent drinks, would point out that the hotel might do much better if an attractive prospectus were sent out, extolling its beautiful location and excellent cuisine and illustrating its charm with a reproduction of the painting. When the hotelier agreed but didn't know how to get such a thing</p>

	done, my father would modestly say that he happened to know a printer would could undertake the job. (The printer, of course, was Frisch's grandfather)."
EARLY- to MID-ADOLESCENCE Focus on technology and solitary play indicates, perhaps, multiple identities but also incomplete development through stage	<p>Mathematics: As an adolescent, one of his uncles introduced Frisch to Olga Neurath, a very remarkable woman and a brilliant student of mathematics. Frisch had discovered the rudiments of differential calculus for himself, however, she showed him how such problems could be attacked in a systematic fashion a year or more before calculus came up in school. She introduced him to the ideas of four-dimensional geometry, and the idea fired him; in a few weeks he had worked out the properties of all the regular polyhedral in four dimensions.</p> <p>Gadgeteering: During high school, he got interested in "gadgeteering" and made himself a little diffraction grating. He also tinkered with radios from the day the first experimental transmission. He had a cat-whisker radio which he made himself and later he made himself a portable tube radio.</p> <p>Experimentalist: "The First World War meant poor food, some worry about my uncles and (worst of all) that I could not buy all the chemicals for my childhood experiments; otherwise it passed me by."</p> <p>"There were a great many books on a variety of subjects in my home, most of which I ignored, I fear, except the encyclopedia. It belonged to my father - a great big three-volume encyclopedia of science of the middle of the 19th century, a fantastic thing. He gave it to me to read, and I read it insatiably for years, day and night, more or less, until it completely disintegrated."</p>
INTEGRATION (Technological Ego Identity)	<p>Frisch: I think my most personally satisfying moment in Physics was that little piece of work I did when Stern was going on a brief holiday and I was left to play with the atomic beam apparatus. It was a quite unimportant little sideline, but it was a discovery which Stern had made previously and which we together had confirmed. We did not have a theory but while Stern was away, I did a systematic pursuit through different conditions of angle and so on and applied a fair lot of spherical trigonometry, which gave me a considerable headache to work it out, to see if there was any regularity. Moreover, I found a regularity that I could not understand. It was extremely simple and quite precisely fulfilled. It was later explained as a very pretty phenomenon - the theory was made in England.</p> <p>This was the piece of work that I enjoyed most, partly because it was careful and difficult experimental work, partly because it was an application of a branch of mathematics that I had to learn for the job, and partly because of the finding of a simple regularity that was completely mysterious.</p>

As the Table attests, I suggest second and third order factors (Clark, Gioia, Ketchen & Thomas, 2010; Gioia, Corley, and Hamilton, 2013) throughout, derived from autobiographers' own words, and afford them an integral role in an overarching model that explains developmental lag among individuals holding multiple identities.

4.2.1 Overarching Needs/Conflicts

A series of psychologists have argued a prominent role for identities in both the differentiation and integration of the self (Mead, 1934; Tajfel & Turner, 1979; Erikson, 1968, McAdams, 1982). Within the self, Maslow has posited a "hierarchy of needs" (1943). Self-actualization, a higher order need first coined by Goldstein (1939), refers to the desire for self-fulfillment, namely, to the tendency for the individual to actualize in what he or she is potentially.

An important element of narrative structure is also an initial lack (Gregg, 2006) or dilemma (Ibarra & Barbulescu, 2010) which the protagonist confronts. Gregg (2006) contends that individuals construct identities in narratives by removing the ambiguity or contradictions inhering in such dilemmas. Thus, he argued that identity is organized simultaneously as (a) a deep structure underlying a set of homologous binary oppositions, as proposed by Levi-Strauss (1963, 1966, 1967, 1975) in his studies of myth, and (b) articulated in a formulaic plot-episode structure, as identified by Propp (1968), Lord (1960), and Raglan (1979) in their studies of folktales and oral epics.

I suggest here that, pertaining to multiple identities, Frisch's most salient need is the lack of demonstrated, productive multiple identities. Frisch's journey seems to represent a pattern of sequential identity transitions. A certain identity seems to dominate at times, and Frisch discovers an integrative ego identity near the end of the sequence. In fact, he describes his most satisfying moment in physics as having integrated each of the mathematician, gadgeteer, and experimentalist identities in one event. Thus, I contend that

P1: An individual may possess an overarching need for multiple identities that drives development through the life course.

4.2.2 Identity-Proliferative Factors

4.2.2.1 Inherited Needs/Genetics

In statistical studies of identical twins (and adopted children), at least half of the variance in personality traits is accounted by genetic differences between people (Turkheimer, Petersson & Horn, 2014; McAdams, 2015). Moreover, actors evoke or seek out environments through mechanisms that can potentially reinforce preexisting tendencies in personality, thereby setting in motion a positive feedback loop of reinforcing dispositional development. While the technological personal identities offered in this study have not received the same scrutiny in this regard, it would be difficult to eliminate the possibility that genes could be responsible for some Frisch's behaviors.

P2: An individual may inherit through birth a need to proliferate multiple identities from a parent who himself/herself has pursued multiple identities.

4.2.2.2 Acquired Needs/Idealization of Father

Murray (1938) and McClelland (1953) were among the first to suggest that needs could also be acquired rather than inherited. Further, psychoanalytic theorists suggest that the idealization of one's parents might be a necessary, even normal part of human development (Kernberg, 1980; Kohut 1971, 1977; Lerner & Van-Der Keshet, 1995). Internalizing their positive aspects improves one's self-esteem, helps to establish long-term goals, and aids in self-consolidation. Through the excerpts provided in Table 2, one can see how idealization of his father – in particular his disposition toward multiple identities and his encyclopedic knowledge acquisition - may have planted the seeds for the multiple technological identities Frisch later claims.

P3: An individual may learn, perhaps through the process of idealization, a need to proliferate multiple identities from a parent who himself/herself has pursued multiple identities.

4.2.2.3 Incomplete Resolution of Previous Developmental Phases

In Table 2, I have provided evidence from his autobiographical materials in which Frisch describes the seeds of his multiple adult identities as originating in childhood and adolescence. Erikson (1968) provides theory consistent with this assertion. For example, he suggests that identity development in childhood includes an escape from fantasy play via the demonstration of competence in things that are valued in the adult world – making things and making them well. Frisch's playful forays into mathematics, gadgeteering, and chemistry experiments, noted in Table 2, seem apt forerunners in a natural progression toward occupational choice when viewed in this light.

At the same time, Erikson notes that during childhood, the focus of task accomplishment also shifts from self- performance to sharing and task collaboration with others. In addition, Erikson (1968) also notes a danger inherent in this transition - that in preoccupation with task competence, children may abdicate some responsibility for the management of higher institutions to those more gifted by birth, choice, or giftedness. That such solitary technological pursuits have persisted into adolescence could perhaps be a sign that the crisis in this stage of development has not been resolved. In addition, it may be that some of the later relationship avoidance bragged about by Frisch ("I never looked for a job in my entire life save one") also has roots in this stage. Finally, it may be that, unable to transition to the next stage, Frisch begins to proliferate technological personal identities here – demonstrated as a recursive effect in the model. For as Table 2 illustrates, he claims to have read a great big three-volume encyclopedia of science, given to him by his father, insatiably for years, day and night, more or less, until it completely disintegrated.

P4: Incomplete progression through a stage such as childhood may cause an individual to proliferate multiple technological identities.

4.2.3 Relationship-Inhibiting Factors

Just as the proliferating identities might cause an individual to experience a lag in development, so too might dispositional traits impede development. Such factors might impair the formation of relationships, thereby making it more difficult for the actor to find work in which new identities could be expressed. Specifically,

Introversion and insecure attachment were two such inhibitory factors that were abstracted from the Frisch and Peierls autobiographical information.

Table 3 below documents comparative first-order data from the autobiographical information of the two eminent scientists under study. The question: in aggregating this data to a second order construct, is one inclined to favor the Introversion facet low sociability or some form of insecure attachment?

Table 3 *Comparative First-Order Data from Autobiographical Information of Otto Frisch and Rudolf Peierls*

Relationships	Peierls	Frisch
1. Father	Not a great success in school but a man with excellent people skills who rose to the top of German industry because of them.	Intellectual.
2. Family Household	Having guests on most weekends; parents who entertained a great deal.	The family curtailed any entertaining at home, as his father became involuntarily embroiled in rescuing his own father's business from near bankruptcy.
3. Siblings	Two siblings; some stories about them.	Never discussed (only child?)
4. Friends	45 pages devoted to "student years." Names several friends and describes several personal relationships he formed.	Mentions only one peer in "student years" by name. One other acquaintance is mentioned (does not remember his name). Both introduced to elaborate on events, not to document close or long-term friendship.
5. Social Activities	"Berlin in 1925 was an exciting place, full of intellectual life, theaters, cabarets, and lectures on any topic imaginable. I had time for all of this." In Munich, professor Sommerfeld would invite parties of students for skiing on winter weekends, and that he partook. In fact, he "spent many weekends and vacations skiing." He also states, "we often spent summer weekends walking in the mountains" and describes closer friendships with fellow students.	Frisch only recalls one school period social activity - he was a committee member of a lawn tennis club - and he relates one anecdote about the experience. However, he mentions no friends in the club, nor are any other social activities included during this period.
6. Relationships with professors	Describes the "human warmth and interest in his students" he grew to know in Sommerfeld. Describes games of table tennis in Leipzig with professor Werner Heisenberg.	Does not describe in much detail any of the professors under whom he studied in college.
7. College Selection	Though at first anxious to see the world, Peierls initially accepted his parents view that he was too young to leave home. He therefore enrolled in the University of Berlin. For advice on whether to pursue experimental or theoretical physics, he visited Fritz Haber, famous chemist and acquaintance of his father. A year later, still craving independence and convinced he was old enough to leave; his parents no longer resisted the idea. Thus, he moved to Munich in his second year of college, again following advice from various people that Sommerfeld's school in Munich was a good one.	The method by which Frisch selected the University of Vienna is conspicuously absent from his autobiography. However, both his father and his aunt, Lise Meitner, had graduated from the University of Vienna. In addition, Frisch did not need to relocate away from his family to attend this school.
8. Marriage	Is married at the age 23 to Genia, a fellow physicist who he met while at a conference in	Does not describe any relationships with the opposite sex until he

	Russia. The marriage “aroused interest in the theoretical physics community because he was about the first of his age group to be married.”	returns to England from Los Alamos at the age of 41. He is married at the age of 48 to Ulla Blau, a woman he had met through his photographer aunt.
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4.2.3.1 Low Sociability/Introversion

McAdams (2015) also lists several studies that have linked dispositional traits to autobiographical memories. Demorest, Popovska, Dabova (2012), for example, find that in individual with high Conscientiousness (C), autobiographical memories in life stories emphasize finding joy in accomplishment, in people with high Agreeableness (A), autobiographical memories emphasize finding joy in affiliation with others, and individuals with high Neuroticism (N), autobiographical memories in life stories emphasize trauma and fear. McAdams et al. (2004) and Raggatt (2006) have also found that high Neuroticism stories include more emotion that is negative, less emotion that is positive, and less growth. High Openness to experience stories differ in structure, having complex plots and distinctions and higher levels of coherence (McAdams, 2015). Finally, Lodi-Smith, Geise, Robins, & Roberts (2009) found that high O, C, E stories tell of personal social exploration and change while low O, C, E individuals tell stories which involve less soul searching and shying away from personal relationships that threaten to change them in fundamental ways during their college years.

According to McAdams (2015), babies exhibit characteristic acting styles known as temperaments that reflect mood, energy level, tempo and alertness. The basic temperament to feel positive emotion and to act in such a way underlies the big five-personality factor called Extraversion. Introversion is not the inverse of Extraversion – the temperament to feel negative emotion and act in such a way. Rather, Neuroticism is the inverse. Thus, Introversion merely refers to the absence of a temperament to feel and act upon positive emotion.

Sociability is a facet of the Introversion factor (Buss & Plomin 1975, 1984; Cheek & Buss, 1981; Goldberg, 1981; Goldberg, 1993). A positive relationship between low sociability, a non-fearful preference for not affiliating with others, and low seeking of social support as a means of coping has been reported. One might consider all of the first-order data presented in Table 3 above evidence of low sociability.

P5: Low sociability, a facet of Introversion, may inhibit the relationship-forming necessary for the successful proliferation of multiple identities.

4.2.3.2 Insecure (Avoidant) Attachment

According to Yip et al. (2017), attachment theory is an established theory of human relationships and among the most influential theories in psychology (Finkel & Simpson, 2015). The theory is centrally concerned with the cognitive– affective processes of “attachment,” defined as the human propensity to seek and develop affectional bonds to particular others (Bowlby, 1969). Although Bowlby (1969) was concerned with parent–child relationships, research on adult attachment has identified similar attachment dynamics in organizational relationships (Hazan & Shaver, 1990).

Yip et al. (2017) suggest that according to Bowlby (1982), when individuals experience a physical or psychological threat, activation of the attachment behavioral system occurs. When activated, the attachment behavioral system triggers a set of responses focused on fulfilling attachment needs by seeking support from others (Mikulincer & Shaver, 2007). Following the activation of the attachment behavioral system, its deactivation occurs upon receipt of social support. Put differently, receiving support in response to stress results in a feeling of “felt security.” However, when support is absent or inconsistent, the attachment behavioral system can become hyper-activated or suppressed (Mikulincer & Shaver, 2008). Over time, the reoccurrence of these positive or negative support experiences result in the formation of generalized working models of relationships, also known as attachment styles.

In the ideal world of secure attachment, an individual apprehends the caregiver to be a safe haven during periods of emotional distress and a secure base from which to explore the world when emotions feel more positive. Alternatively, according to Yip et al. (2017), anxious attachment refers to “the extent to which a person worries that others will not be available in times of need and anxiously seeks for their love and care” (Mikulincer & Shaver, 2015, p. 18). Anxious attachment is associated with a person's negative self-perception and preoccupation with affirmation from other people. Attachment anxiety predicts heightened arousal, lower levels of emotion regulation, and hyper-sensitivity to social and emotional cues from others (Fraley, Niedenthal, Marks, Brumbaugh, & Vicary, 2006). Avoidant attachment, in contrast, refers to “the extent to which a person distrusts others' good will and defensively strives to maintain behavioral and emotional independence” (Mikulincer & Shaver, 2015, p. 18). Avoidant attachment is associated with a negative perception of other people. This corresponds with a “deactivation of proximity seeking, inhibition of the quest for support, and active attempts to handle distress alone” (Mikulincer, Shaver, & Pereg, 2003, p. 85).

One also might consider all of the data presented in Table 3 above evidence of avoidant attachment as well. In fact, individuals who experience less anxiety about rejection by others and less interpersonal avoidance will likely have a more positive career development process according to Wright and Perrone (2008). Wright (2017) also negatively related Avoidant attachment style to networking, job searching, and personal exploration self-efficacy.

Attachment dimensions, even after controlling for the Big Five personality traits, are stable over time (are traits, Fraley et al., 2011). A positive association between avoidant attachments and the low sociability and warmth of Introversion (low Extraversion), the distrustfulness and uncooperativeness of low Agreeableness, and Neuroticism as well (Nofhle & Shaver, 2006). However, attachment dimensions have consistently predicted relationship quality better than the Big Five factors or their facets did. Across analyses of relationship quality, Avoidance has been the strongest predictor. The Big Five scales do not consistently predict relationship quality. At the facet level only three of the 30 facets made significant contributions to predicting relationship quality beyond the attachment dimensions. Furthermore, two of them (anxiety and compliance) ran in non-intuitive directions. Thus, for research on attachment style and close relationships, Big Five trait scales cannot substitute for attachment measures (Nofhle & Shaver, 2006).

Based on the preceding discussion, I conclude that either low Sociability or trait avoidance attachment could be present in the Frisch autobiographical information. Furthermore, both may have independent effects. Moreover, the previous literature has not determined whether they interact but is a possibility here. In any case, both suggest an inhibitory effect on success in pursuing jobs in which multiple identities might be developed. Hence, both are included in the model.

P6: Avoidant attachment may inhibit the relationship-forming necessary for the successful proliferation of multiple identities.

P7: Both proliferation inducing and relationship inhibiting factors will contribute to lags in development.

4.2.4 Specific Transitions

Appendix A gives source data for each of Frisch's identity transitions while Table 5 below summarizes the data into second order categories.

Table 5: Second-Order Categorization of Frisch Identity Transitions

Transition #1: Mathematician to Gadgeteer

Forces for Transition

1. High school: Pencil swallowing incident
2. High school: Low pay for tutoring
3. High school: Headaches (physical)
4. Entry to Univ. of Vienna: Discovery of equals (competition keener)
5. Univ. of Vienna: Attracted to only certain disciplines of math (topology)
6. Symbolism of math: Wastebasket and pencil
7. Eudaemonic: Concrete strength (good with hands) versus abstract
8. Famous aunt arranges opportunity after 2 ½ years of majoring in math

Forces Against

1. Already offered research position in math
2. Lacks experience in physics

Transition #2: Mathematician/Gadgeteer to Experimentalist

Forces for Transition

1. Childhood: Chemistry experiments
2. Role model Aunt
3. Motivation and idea (part-time job)
4. Learned skill from Stern

Forces Against

1. Low sociability/avoidant attachment
 - Attends colloquium only after encouragement from Aunt
 - Introduced to Einstein by Aunt
 - Part-time job set up by Aunt
 - Assistance from Aunt (books)
2. Lacks skills (only learns how to plan experiment from stern (4th job)

3. Aunt is not the best mentor
 - Own experience is long, struggling process to get full-time paying job
 - Is nephew and has nepotism concerns (will not hire into own lab, only recommends on Agreeableness)
4. Lacks jobs in which experimentation is critical skill (trouble-shooter, PTR, build device under Pringsheim)

In general, each of Frisch's transitions among identities contain transition-specific causes. However, they also contain the recognizable effects of generalizable factors (e.g., low sociability, avoidant attachment) noted above. For example, low Sociability or insecure attachment seems explain his attendance at the colloquium in Berlin only after prodding by his Aunt. Agency also seems indeterminate – causes of the transitions seem to include elements in Frisch's environment and those motivating his own strivings. However, in his narratives, the time duration between initial descriptions of the associated conflicts and resolution are substantial - 4 to 5 years in the case of transitioning from mathematician to gadgeteer/experimentalist and approximately 8 years in the transition from inept to competent solo experimentalist.

The pattern of Frisch's sequential development through multiple identities seems to resemble a pattern articulated by Barresi (2006) regarding the autobiography of Malcolm X. Barresi (2006) suggests multiple sequential identities drawn from addressing an overarching conflict or need – confronting a birth myth (being born black into a hostile White racist culture) in the case of Malcolm X. Indeed, the author suggests that Malcolm consecutively constructs identities as surrendered (becoming White), negative (hustler in a wholly Black community), religious fundamentalist (leader in a Black separatist movement, the Nation of Islam), and, finally, leader of his own Islamic organization (people of many visible races getting along together without racism, Muslim Mosque) in his autobiographical narrative.

A similar pattern emerges in Frisch's accounts. Frisch was originally a Mathematician, but he subsequently transitions into a dual Gadgeteer/Experimentalist role. The mathematician role is suppressed but not forgotten – it plays a part in several events in the future. In addition, having few skills or education as an experimentalist, Frisch finds it difficult to obtain work in which his Experimentalist skills could be learned and, ultimately, showcased. Thus, the Gadgeteer role dominates and he suppresses the Experimentalist role until he can find suitable work. Once suitable work is located, however, Frisch is able to demonstrate the Experimentalist identity and, indeed, the integration of all three identities, within two to three years. In fact, Frisch describes the integration of all three identities as his most satisfying moment in physics.

P8: In some individuals possessing multiple identities, development is a sequential process that proceeds from less to more identity complexity.

P9: In some individuals possessing multiple identities, some factors affecting any specific transition will be different, while other factors may be generalized (e.g., needs, traits) to multiple transitions.

5. Overall Longitudinal Model of Multiple Identity Development

Based upon the findings of my investigation, and upon the propositions suggested above, I propose a longitudinal model of multiple identity development per Figure 1 below.

6. Managerial Implications

In this study, I have abstracted from the psycho-biographical accounts of eminent scientists influences on multiple personal identity development that may begin early in life and extend through multiple stages of development. The findings outlined here suggest that potentially outstanding yet introverted or avoidant-attached researchers will not vigorously engage in job search activities. Tailoring HR recruitment, selection, and training procedures to their unique needs might make it possible to locate undervalued researchers and to acquire them at an earlier career stage.

In addition, family mentors (father, aunt) seem to have had an undue influence on the technological identity development of young Frisch. Perhaps these factors might justify the intervention of an appropriate mentor or an attachment-related intervention.

7. Limitations and Directions for Future Research

7.1 Directions for Future Research

As far as the link between development lags and individual performance is concerned, my research suggests some interesting avenues for future research. First, the development lag between the two researchers seems recoverable – Frisch is as prolific as Peierls in scholarly publications, albeit with an approximate seven year lag. However, the time period studied includes the early “entry” of both researchers into the accumulative advantage process (Merton, 1968; Allison, Krauze, & Long,

1982; Cole & Cole, 1973; Walberg & Tsai, 1983; Walberg & Stariha, 1992; Walberg & Arian, 1999). Is this effect due entirely to entry into a favorable situation - the accumulative advantage process - or do previous development differences persist, perhaps manifesting themselves in other ways? For example, in later developments, Frisch and Peierls find themselves in a very similar situation – shortly after the discovery of nuclear fission, both are enemy aliens located at the University of Birmingham. They become friends. However, while Peierls hews to the prevailing global paradigm that an atomic bomb is not possible (Rose, 1998), Frisch is able to reframe the problem such that in using pure U^{235} and assuming fast neutrons, the device is possible. Are differences in the development process responsible for the difference in creativity? In addition, though my data suggests some difference in socioeconomic status between the two families, I have not included it in the model. Is it possible that one should extend the accumulative advantage process further backward, into the childhood and early- or mid-adolescent years?

Recent technological trends implying that less is more and small is beautiful (miniaturization, nanotechnology, micro fluidics, autonomous drones, 3D printing, the circular economy; Epicopo, 2011; Rodrigues et al., 2017; Unruh 2018) may require a novel approach. The relatively new identity discovered here (gadgeteer) extends the identity literature and the career development literature in this direction. However, I do not investigate the particulars of the identity, especially how it addresses the trends above, in this study. There is a need for further investigation. For example, Anderson (2012) offers the concept of a “maker” identity. There are some differences between the maker and the gadgeteer identity. The maker nominally implies manufacturing while a gadgeteer identity implies work on a smaller, novel device. In addition, a maker represents a unitary identity, whereas Frisch actually integrated multiple identities (gadgeteer, experimentalist, mathematician, and theoretician) over his life course. Finally, few examples of “makers” in universities exist in the literature.

Nevertheless, there are similarities too. Both the maker and the gadgeteer build things, both are, to some extent, good with their hands, and both conceive of new products. However, there is a possible advantage of the maker construct versus the gadgeteer construct developed in this paper. That is, that the notion of the maker has been developed in the context of the 21st century. Thus, it is tied to newer electronics (Integrated circuits versus discrete components), related to better software (CAD, open source, standardized files, desktop computing), integrated with some forms of manufacturing and the Internet, and associated with better hardware (e.g., robotics manufacturing). It also implies an entrepreneurial mindset and is associated with “virtual communities” of like-minded souls. Bringing the gadgeteer into the 21st century while at the same time preserving the fundamental differences between the two constructs would likely be a beneficial follow-up to this study.

Finally, it is possible that in examining career pluralist samples, research examining contemporaneous multiple identities (Caza & Creary, 2016; Caza, Moss & Vough, 2018) has not incorporated the notion that struggles with multiple identities may change depending upon the stage of identity development within the individual. For example, Frisch appears to confront different issues in each of his two identity transitions. Moreover, it also possible that by assuming jobs are isomorphic with identities (social identities), previous researchers have missed some identity development struggles that they attribute to coping with multiple

contemporaneous jobs. With respect to individual work role transitions (Ibarra, 1999; Ibarra and Barbulescu, 2010), it is also possible that my identification of overarching elements not specific to any individual transition (e.g., the need for multiple identities, traits generalizable to multiple transitions, etc.) has complemented this body of literature.

7.2 Limitations

Consistent with the sample chosen (two eminent scientists), there are, of course, concerns that the model developed in this article is not generalizable to a larger population. Moreover, some limitations in this study are consistent with internal validity concerns associated with qualitative psycho-biographical research. For example, the autobiographical material may suggest differences in other psychological constructs (e.g., self-confidence, experience) for which it would be difficult to control in this mode of research. Similarly, though empirical evidence was selected according to the model espoused by McAdams (2001), other researchers might have selected different excerpts and drawn different conclusions from the autobiographical materials. In addition, whether the autobiographical memories of the two researchers are veridical is always a question. Indeed, AIP interviewed both subjects after the age of fifty, and each wrote his autobiographical book after the age of seventy. In addition, the chronological order in which the books appear may be important. Frisch's autobiography appeared in 1979 and Peierls, likely having seen it, may have altered his own 1985 autobiography accordingly (it is 140 pages longer, for example). All of the concerns above suggest directions for future research.

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Appendix A: First Order Data for each of Frisch's Identity Transitions

Transition #1 Mathematician to Gadeteer/Experimentalist

Early Mathematician. "I was a bit of a prodigy who could speak, read, and do arithmetic earlier than most children. I could multiply fractions in my head when I was five, or so I was told. It was my father who aroused my interest in mathematics – real mathematics, not arithmetic. When I was 10	Seeds of Conflict. During the more tedious lessons (in high school) I used to play chess under the desk with Hans Blaskopf, the boy next to me. Once as I was deliberating my next move and thoughtfully tapping the pencil stump I held between my teeth, it suddenly slipped into my	Actual Transition from Mathematician to Gadeteer/Experimentalist: "Two and a half years after I started, when it was time for me to think about a doctor's thesis, I got an opportunity. I don't know how it happened. I dare say Lise Meitner may have made a suggestion to that effect. She knew my supervisor well. He was Professor Karl Przibram, who was not the head of the department, but I think it was the professor under him (Professor Stefan
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<p>years old he introduced me to Cartesian coordinates: he drew two straight lines at right angles on a piece of paper and told me how to attribute two numbers (coordinates) to any point by calling the distance from the vertical line x and the distance from the horizontal line y. Then any equation relating x and y would represent a whole set of points, in fact a curve. The next day I came back with the equation of the circle $x^2 + y^2 = r^2$...when I was about 12, he introduced me to trigonometry. I still see his astonished face when, having defined sine and cosine, he wrote down (expecting to surprise me) the equation $\sin^2 x + \cos^2 x = 1$ and I said 'well, that's obvious.'</p> <p>"One of my uncles introduced me to Olga Neurath, a very remarkable woman. I was about 16 when I was introduced to her. Years previously, she had been a brilliant student of mathematics. The young mathematicians in Vienna adopted her as a kind of communal godmother. She explained mathematics to (us), and we all marveled at her ability to do quite complex calculations in her head."</p> <p>"(By sixteen) I had worked out the focal length of a concave mirror by an odd trick which I found exciting; indeed I had discovered the rudiments of differential calculus for myself. She (Olga Neurath) showed me how such problems could be attacked in a systematic fashion, a year or more before calculus came up in school, and much more exciting through the way she guided my probing mind."</p> <p>"She also introduced me to the ideas of four-dimensional geometry, and the idea fired me; in a few weeks I worked</p>	<p>mouth and down my gullet before I could stop it. Along its tortuous journey, from which it eventually reappeared after several days, it split lengthwise, the lead having been used in blackening my inside...I remember that incident mainly because it almost lost me the chance of attending a popular lecture by Albert Einstein."</p> <p>"It was toward the end of my school days, in 1922, that inflation hit Austria. I gave coaching for several months to a schoolmate who had trouble with mathematics. His grateful parents doubled the fee which had been agreed in advance; I kept it in my pocket for a couple of weeks and then used it to buy a pencil, an ordinary wooden pencil; that's all I got for it."</p> <p>"When I entered the University of Vienna in 1922, I realized there were a few other mathematical geniuses around. Moreover, I began to feel that perhaps I wouldn't want to spend my whole life with a pencil and a waste basket as my tools...I had always enjoyed making things so I turned to physics...in fact, I read so little mathematics that I very nearly failed my final examination."</p> <p>Well, they (my professors) certainly did do things like, shall we say, the Hamiltonian equation, the Lagrangian equation and the Jacobi equation and things like that, plus classical physics. I remember that I found that very tough going because I couldn't see what it meant. The mathematics</p>	<p>Meyer) in radioactive physics at the Radium Institute, as it was called, who suggested a problem to me."</p>
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<p>out the properties of all the regular polyhedral in four dimensions. The most complicated one, consisting of 120 pentagon dodecahedra, took several days of preparation and then two hours of unremitting concentration which gave me the first headache of my life. Those four months of fascination with four-dimensional geometry were excellent training which later helped me, and still does, in designing complex scientific devices. I still think of Olga with affection and gratitude.”</p>	<p>was reasonably simple and easy to follow, but I didn't know what it meant. And my own interest in mathematics was much more directed to what seems like number theory and topology, really pure abstract mathematics for the joy of it. So, as I had some interest in Physics, and also because I began to feel that I didn't want to do something completely abstract all my life but would rather use my hands – I have quite good hands – I turned over to Physics halfway through at a time when I had already been offered the chance to do research in mathematics.</p>	
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Transition # 2 To Experimentalist

<p>Dissertation. For my dissertation, I worked with Przibram in Vienna, who had been interested in the discoloration of salts by radiation. He suggested I should reproduce what other people had found, namely discoloration by fast electrons; and then see how much I could lower the energy of electrons before the thing fails. My professor apparently thought that I was doing quite nicely building up the necessary gadgetry, and he never pushed me into doing more reading. I only got that when I got to Berlin afterwards. And I managed to get not discoloration, but thermo luminescence down to something like 6 volts, but it was an extremely vague and subjective phenomenon. All I got was two experiments, where I did observe a little light flash after bombarding at 6 volts. I did not get anything at 8 volts; I got it quite clearly at 10 volts. So that's the quality of the work I produced. And I did get my Ph.D. all the same, Doctor of Philosophy to be precise.</p>	<p>Second job: I was quite happy there (with Strauss) for a year, and then to my surprise I got an enquiry about whether I wanted to come to Berlin to work at a government lab (P.T.R.) with a fellowship - a grant to work on this unit of light. I jumped on it because it was a chance to go abroad and a chance to see new places and new people and so on. And that's what got me back into science, even though there my job really wasn't frightfully scientific. “While at the P.T.R. my main contact with academic life was through the weekly colloquia at the university. It was, of course, Lise Meitner who made me go at first... I only met Einstein once, when Lise Meitner suddenly stopped me with the words ‘here is Einstein, let me introduce you.’”</p> <p>3rd job. “My employment at the P.T.R. lasted three years but the last year I worked part-time at the physics department of the University of Berlin in the section of Professor Pringsheim...Lise Meitner got me in touch with him (whom she knew well, he had actually worked at the KWI-C as early as 1908 when she started there (Sime, 1996)). All the same, the whole thing had gotten me in touch with Pringsheim, and he</p>	<p>Age 28, toward end of 4th job, actual transition to Experimentalist: I had thought of an experiment before I knew of atomic beams. Later I found that Stern had listed it among the things to be done with the molecular beam method. I thought if one could have a beam of atoms, one could do it that way, so I felt it was really my experiment. So when I went there, I told Stern that I would love to do that experiment, partly because I had thought of it independently. So towards the end of my stay with him, he let me go and do this experiment on my own, rather than be his assistant.</p>
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<p>First job. “After that (the 1926 graduation with a D.Phil.) I was a bit at a loose end. (My first boss was) Sigmund Strauss, a friend of my father's and a very remarkable and brilliant inventor (who) happened to have an opening, and so in I went.</p> <p>At that first job he didn't get paid for the first six months. He was allowed to help along and to get some experience. Later on, when Strauss found that he could debunk his wrong ideas at a great rate, he paid him. Strauss had about a hundred ideas a day, 99% of which were nonsense. And so, being dominated by a superior, Frisch rarely had the opportunity to pursue his own ideas.</p>	<p>gave me employment when my grant at the P.T.R. ran out...it had just been realized that mercury vapor was highly poisonous; clearly there was a need for an instrument that could rapidly test the air of a room...Pringsheim had worked out how that instrument should be made...and I built it what he wanted.</p> <p>4th job. “Stern had been making some inquiries.” “In 1930 I was offered a job in Hamburg – a real job this time, not just a grant. One foot at last on the academic ladder! I think Pringsheim recommended me highly. (Stern's lab) was certainly my first introduction into the problems of modern physics and into the idea of not merely inventing gadgetry but actually planning experiments.”</p>	
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About Our Author

Martin Monroe has worked in academia at Texas A & M, Oklahoma State, and University of Houston-Downtown. He has published in the *Journal of Management* and presented at national and regional academic conferences. He has taught a variety of courses, including strategy, OB, HRM, and change management, at the graduate and undergraduate levels. Martin has also worked for 11 years at the US/Latin American HQ of Exxon Chemicals, consulted in strategy at Shell Chemicals HQ, and been the CEO and founder of a biotechnology firm based upon novel biosynthetic technologies related to genetic engineering of microbes.