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The Degeneration of the Human Mind: An Analysis of Alzheimer's Disease, A Kuhnian Perspective

Genevieve Ilg
Providence College

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Fr. Torchia

Abstract: In 1906, a German physician, Dr. Alois Alzheimer, specifically identified a collection of brain cell abnormalities (and the formation of plaque in the brain) as a disease, which forever changed the way scientists view degenerative cognitive disorders. Today, this brain disease bears his name, and is one of the most common diseases among the aging population. The discovery of Alzheimer's Disease (AD) can be seen as a revolutionary, paradigmatic shift in regards to scientific discovery from a Kuhnian perspective. In that vein, the discovery presents philosophical implications for the notion of personhood and how those suffering from AD are treated in society.

Contents:

I. Introduction of the Topic

When considering the history of scientific development, one often thinks of groundbreaking discoveries such as the polio vaccination, the double-helix structure of DNA, and the Human Genome Project. To that effect, we often overlook the revolutionary discovery of Alzheimer's Disease (AD), perhaps taking for granted the prominence of mental illness in society and the aging population. Progressive mental deterioration in old age has been documented throughout history. However, it was not until 1906 that a German physician, Dr. Alois Alzheimer, specifically identified a collection of brain cell abnormalities (and the formation of plaque in the brain) as a disease. Today, this degenerative brain disorder bears his name, and is one of the most common diseases among the aging population. Since its discovery 107 years ago, there have been various scientific breakthroughs in AD research, pushing the boundaries of the AD paradigm.

Dementia, the medical condition that often progresses to AD, was addressed in the 18th and 19th centuries; however, it was often associated with "general paralysis," "madness" and "hysteria" (Berrios 1) – general terms used to define a broad array of mental illness symptoms. It was solely because of Dr. Alzheimer, and his discovery of this particular advanced-stage mental deterioration, that led to its differentiation from other types of mental illness. More importantly, individuals must ask themselves about the impact scientific development has on their conceptions of reality – and in this case – the philosophical impact of the discovery of AD.

To support the philosophical significance of scientific paradigm shifts and personhood, I will use Thomas Kuhn's methodology of philosophical analysis. A

paradigm shift (or revolutionary science) is, according to Kuhn in *The Structure of Scientific Revolutions*, a change in the basic assumptions, or paradigms, within the ruling theory of science, which is in contrast to his notion of normal science where scientists problem-solve within a paradigm. The periodic change in science causes individuals to rethink personhood – that is, the status of being a person in a given environment. For example, Kuhn in *The Copernican Revolution* writes about how the changing understanding of the sun-centered universe from medieval to modern Western society seemed to affect man's relation to the universe and to God… it was "therefore also a part of the transition in Western man's sense of values" (2). The same is true for those in the early 20th century who were living during the discovery of AD.

Without an examination of scientific paradigm shifts, it is difficult to comprehend the impact of science on the external world. Without such shifts, scientific advancement does not occur. However, it is because of them that acceptable and valid science is questioned within the professional community. As science keeps evolving, it is difficult for individuals to pinpoint an explanation for how the world works and how they can define themselves within it. For those who are not cognitively impaired, defining their sense of reality within the realm of altering science is difficult. For those who are experiencing mental deterioration, their ability to perceive the world is biologically altered and nearly impossible. Concurrently, the scientific understanding of the world around them continues to evolve. For these individuals, the notion of personhood is an abstract idea because it can never be fully explored in a world of paradigm shifts *and* mental deterioration. Therefore, Dr. Alzheimer's discovery of AD served as a paradigm

for other diseases, while simultaneously raising philosophical questions concerning the definition of personhood.

II. History of Alzheimer's Disease (AD)

Dr. Alois Alzheimer was born on June 14, 1864 in Markbreit, Germany, and studied medicine at the top universities in Germany. By 1888, he was promoted to senior physician (Maurer 1546). Since its discovery 107 years ago, dementia of the Alzheimer's type (as it is formerly known) is considered to be one of the most devastating diseases of old age. Despite intensive research about the illness, the disease still remains elusive (Zilka 343). However, the advances of Alois Alzheimer are revolutionary because the concept of psychosis "dates only from the late 19th century. It was formed out of the remnants of three ancient categories: insanity, alienation, and dementia" (Berrios 1). During the first half of the 19th century, epilepsy and other insanities were considered neurotic disorders. "Under the influence of factors such as the decline of the 18th century Cullean concept of neurosis, the development of the new descriptive psychopathology, the introduction of statistics, and the availability of longitudinal observations of hospitalized cohorts," mental illness was redefined (Berrios 1). Before the discovery of AD, general paralysis was the most common diagnosis of patients with depression who went on to develop dementia, and by 1883, there was awareness that this severe affective disorder created cognitive impairment (Berrios 393).

"Alzheimer made fundamental contributions to understanding other diseases such as vascular dementia, Huntington's chorea, syphilis, brain tumors, and epilepsy," (Zilka 345). His many years of research "serve as the foundation for today's extensive search for a cure of the disease that bears his name" (Zilka 345). The markings of his

revolutionary research began in 1906, at the 37th meeting of Southwest German Psychiatrists in Tübingen. Alzheimer presented his clinical and neuropathological findings on Augusta D, a 51-year-old woman, who suffered from an unusual disease of the cerebral cortex, which caused memory loss and disorientation, followed by depressions and hallucinations (Zilka 344). He recorded his findings in a short abstract and presented it at the 37th meeting. He reported at the conference, "the pathological examination revealed atrophy and specific lesions, which he described as a 'paucity of cells in the cerebral cortex and clumps of filaments between nerve cells' (*eine eigenartige Erkrankung der Hirnrinde*, as it is known in German)," (Zilka 344). These results were declared, after further research, to be the "first images of plaque and neurofibrillary tangles" in Augusta D.'s brain (*Karolinksa Institutet* 1).

On November 25th, 1901, a 51-year-old woman named Augusta (sometimes spelled as Auguste) Deter was sent to the Frankfurt Hospital, where Alzheimer worked. She had the symptoms of the legal definition of dementia, which included impaired memory, aphasia, disorientation, and psychosocial incompetence. Her condition became more severe, and she began to lose her cognitive functions and to experience hallucinations (Maurer 1546). "Because of her age, Deter was diagnosed with presenile dementia; today, the diagnosis would be early-onset AD, which is defined as development of the condition before the age of 65" (Maurer 1547). At age 55, Deter died, and by this time, Alzheimer had left Frankfurt and was working under Emil Kraepelin at the Royal Psychiatric Clinic in Munich. Upon her death, Alzheimer requested that her medical records be sent to him (Maurer 1548). In 1995, Dr. Maurer and his colleagues rediscovered the file (Maurer 1548).

Alzheimer, in those files, concluded that Deter "had no sense of time or place. She could barely remember details of her life and frequently gave answers that had nothing to do with the questions and were incoherent. Her moods changed rapidly" (Maurer 1547). She seemed to be consciously aware of her helplessness. Alzheimer called it the "Disease of Forgetfulness" (Maurer 1548). For example, around midday during one afternoon of evaluation, Deter ate pork and cauliflower. Alzheimer interviewed her as she ate; Deter's responses are in italics in this excerpt from the medical file dated November 26, 1901:

> "What are you eating? *Spinach* (she was chewing meat). What are you eating now? "*First, I eat potatoes and then horseradish*. Write a 5. She writes, '*A woman*.' Write an 8. She writes, *Augusta* (while she is writing she again says, *It's like I have lost myself*) (Maurer 1548).

On November 29, 1901, on the same page, Maurer reprints this excerpt of Alzheimer's file:

> If you buy six eggs, at 7 dimes each, how much is it? *Differently.* On what street do you live? *I can tell you. I must wait a bit.* What did I ask you? *Well, this is Frankfurt or Main.* One what street do you live? *Waldmarstreet, not, no*…When did you marry? *I don't know at present. The woman lives on the same floor*. Which woman? *The woman where we are living*…I show her a key, a pencil, and a book, and she names them correctly. What did I show you? *I don't know. I don't know.* It's difficult, isn't it? *So anxious, so anxious.* I show her three fingers; how many fingers? *Three.* Are you still anxious. *Yes.* How many fingers did I show you? *Frankfurt or Main.*

Five years after her evaluation, she died. Alzheimer requested that her medical files be sent to him for further evaluation.

When Alzheimer examined the reports of her brain and the autopsy, he found that in the later years of her illness, her condition had deteriorated considerably. He noted previously that he had seen this type of degenerative condition in other patients, but this

was the first one who had experienced these symptoms at such a young age. Her death was the result of sepsis caused by an infected bedsore. On examining her brain, he found senile plaques and neurofibrillary tangles (Maurer 1548). Alzheimer anticipated the debate about which type of dementia Deter may have had by his remark in the 1907, "a histopathological analysis of a later point will show the peculiarity of this case" (Maurer 1549). In 1910, the disease was named after Alzheimer when his superior Emil Kraepelin found the description of this disease in a textbook (*Karolinksa Institutet* 1). More than a century later, her case was re-examined with modern medical technology, where scientists found a genetic cause for her disease. Maurer published the results, and according to it, "a mutation in the PSEN1 gene was found, which alters the function of gamma secretase, and is a known cause of young onset AD" (Maurer 1549).

Since then, there have been several breakthroughs in science regarding the particulars of AD. The *Karolinksa Institutet* annotated the following timeline. In 1976, the deficiency of the acetylcholine (ACH) neurotransmitter was linked to AD, paving the way for the drugs in use today to slow of the progression of the disease. In 1984, Glenner and Wong identified the presence of the *beta-amyloid* protein in the plaque developed in the brain. In 1986, the tau protein was discovered in the development of the neurofibrillary tangles. In 1992, mutations of the gene that codes for the protein deposited in the plaque were identified. In 1993, a mutation in the *apoplipoprotein E* gene was linked to AD, while the first AD drug to inhibit the production of ACH was registered in the United States. In 2002, the new form of the NMDA receptor blocker was registered (1). Most recently, in 2012, researchers discovered the gene TREM2's potential metabolic pathway in the production of toxic shards of a protein that accumulates in

plaques on the brain. TREM2 is only the second gene discovered to increase the risk of AD substantially in older persons (Guerriero 1). These developments are single-handedly associated with Alzheimer's discovery, because his revolutionary research was the cornerstone for all of the following scientific investigations.

III. A Kuhnian Analysis: The Significance of Paradigm Shifts

A mature science, according to Kuhn, experiences alternating phases of normal science and revolutions. In normal science, the key theories, instruments, values, and metaphysical assumptions that comprise the disciplinary matrix are kept fixed, allowing for the generation of solutions, whereas in a scientific revolution the disciplinary matrix undergoes revision, in order to permit the solution of the anomalous puzzles that disturbed the preceding period of normal science. Kuhn sees multiple revolutions in the history of science; that is, multiple cases of the overthrow of one scientific paradigm by another. The discovery of AD is a clear example of this, both historically and philosophically. As evident above, the discovery of AD is distinctly paradigmatic, and Kuhn would agree.

In order to apply a Kuhnian analysis to this scientifically historical event, one has to accept his assumptions (one's elaborated on through out *The Structure of Scientific Revolutions*): that scientific fields undergo periodic paradigm shifts rather than solely progressing in a linear and continuous way; that these paradigm shifts open up new approaches to understanding what scientists would never have considered valid before; and that the notion of scientific truth, at any given moment, cannot be established solely by objective criteria but is defined by a consensus of a scientific community. Competing paradigms are frequently incommensurable, that is, they are competing accounts of

reality, which cannot be coherently reconciled. Thus, one's comprehension of science can never attain full objectivity.

A particularly important part of Kuhn's thesis in *The Structure of Scientific Revolutions* focuses upon one specific component of the disciplinary matrix. This is the consensus on exemplary instances of scientific research. The central idea of this book is that the development of science is driven, in normal periods of science, by adherence to what Kuhn calls a "paradigm." He cites Aristotle's analysis of motion, Ptolemy's computations of planetary positions, Lavoisier's application of the balance, and Maxwell's mathematization of the electromagnetic field as paradigms (Kuhn 23). The functions of a paradigm are to supply puzzles for scientists to solve and to provide the tools for their solution (Kuhn 35). A crisis in science arises when confidence is lost in the ability of the paradigm to solve particularly worrying puzzles called "anomalies" (Kuhn 52). Crisis is followed by a scientific revolution if a rival supersedes the existing paradigm. Kuhn claimed that science guided by one paradigm would be "incommensurable" with science developed under a different paradigm, by which he meant that there is no common measure for assessing the different scientific theories (Kuhn 145-148). This thesis of incommensurability does not allow for a theory of normal science, consequently rejecting some traditional views of scientific development, such as the view that later science builds on the knowledge contained within earlier theories, or the view that later theories are closer approximations to the truth than earlier theories.

He adds that "normal science is cumulative and it owes its success to the ability of scientists regularly to select problems that can be solved with conceptual and instrumental techniques close to those already in existence" (Kuhn 96). Although it is

intuitive to say that science contains some level of accumulation, Kuhn holds that such is incommensurable throughout his writings, and then, later revises his thesis to allow for a cumulative process. Although many would view this theory as inconsistent, in the case of AD, the problem of accumulation is irrelevant because the discovery of AD was the first of its kind. The subsequent developments following the initial discovery could be more thoroughly analyzed in regards to incommensurability. Dr. Alzhiemer's work, however, was not only revolutionary then, but also original.

For example, Aristotelians said that a stone fell because its "nature" drove it toward the center of the universe (Kuhn 104). Kuhn devoted *The Copernican Revolution* to exploring the history of scientific development to further support his philosophy of paradigmatic shifts. Kuhn's analysis of the Copernican paradigm shift emphasized that, in its beginning, it did not offer more accurate predictions of celestial events, such as planetary positions, than the Ptolemaic system, but instead appealed to some practitioners based on a promise of better, simpler, solutions that might be developed at some point in the future. Kuhn called the core concepts of an ascendant revolution its paradigms. Kuhn writes, "Copernicus' innovation first destroyed that traditional explanation of planetary motion and then, as modified by Kepler, suggested a radically new approach to celestial physics," (Kuhn 245). Dr. Alzheimer's discoveries overturned previously accepted views of degenerative cognitive disorders, which were clumped together as neurotic disorders, such as epilepsy and insanity (Berrios 1). By extension, Dr. Alzheimer's work can be viewed as paradigmatic.

He writes, "The new paradigm, or a sufficient hint to permit later articulation, emerges all at once, sometimes in the middle of the night, in the mind of a man deeply

immersed in crisis" (Kuhn 89). In this sense, paradigm shifts are almost spontaneous and not directly affiliated with normal science. Scientific revolutions are then "non-cumulative developmental episodes in which an older paradigm is replaced in whole or in part by an incompatible new one" (Kuhn 92). Moreover, Kuhn claims that paradigm shifts in science are equivalent to the transition of politics within a community. "As in political revolutions, so in paradigm choice there is no standard higher than the assent of the relevant community" (Kuhn 93). Kuhn's hunch is that scientific change brings about a change in the entities that are taken to be primitive and unexplained. These concepts hold when applied to AD.

In 1910, Emil Kraepelin in his influential, *Psychiatrae: Ein Lehrbuch für Studierende and Aerzte*, stated, "The clinical interpretation of this AD is still unclear. Although the anatomical findings suggest that we are dealing with a particularly serious form of senile dementia. However, the fact is that this disease sometimes starts as early as in the late forties" (Zilka 344). It is because of the age of onset that researchers determined that this disease was something newly discovered, and it became a significant in the development of this new brain disease. "Relatively rare AD was separated from senile dementia and accepted as a diagnostic category. This classification remained intact until the last third of the 20th century" (Zilka 345). It is evident, then, that AD created a new paradigm in regards to psychiatry and degenerative cognitive disorders. However, as Kuhn also argues in his writings, scientific progress is not purely objective. "Some authors claim that Kraepelin's decision to separate a pre-senile form of dementia from senile dementia and to put the name of AD for the former one was most probably inspired by political reasons rather than by exact scientific data" (Zilka 345). Here, the problem of

trying to balance subjective goals with scientific fact is a realistic struggle.

As far as the main conclusion of Kuhn's theory is concerned, Kuhn's argument is convincing. There is no doubt that the worldview that emerges from a scientific revolution may be incommensurable, but it is so in a weak sense. That is, new terms describing the new revolution may not be straightforwardly comparable to the "old science," and the new paradigm leads to at least some incompatible predictions when compared to the scientific theory it replaced. The same holds true for AD – the minute details separating pre-senile and senile dementia are still relatively unclear today, 107 years after the discovery of AD. After reading *The Copernican Revolution*, it is clear that most paradigmatic shifts are the results of centuries of scientific research. The history of scientific development is a long one. The major incongruity within Kuhn's theory raises the question: If many paradigms do not change in a sudden way, how are they not built on prior knowledge? There is often a foundation supporting paradigm shifts in order to allow it to occur. For example, the paradigm shifts concerning planetary motion came out of centuries of scientific research. After reflecting on the prompt, it is clear that Kuhn comes from two different vantage points.

At one point, Kuhn claims, at least, that scientific advancement is historically aggregated. In some cases this theory is true, but it does not completely explain the "eureka" moments of scientific discovery or the scientific discoveries that happen accidentally or spontaneously. The field of psychiatry is aggregated, but the discovery of AD is an equivalent to these eureka moments of scientific discovery. In order to revise this, Kuhn contradicts himself by first claiming that science usually "does not aim at novelties of fact or theory," but then goes on to say that "history even suggests that the

powerful scientific enterprise has developed a uniquely powerful technique for producing surprises" (52). Kuhn does not elaborate on this method for producing "surprises;" he asserts that it exists to account for the fact that his philosophy demands that the usual course of science produces both slow progress and rapid change.

When Kuhn later writes that science is not cumulative, he means that the scientific revolution replacing "normal science" is one separate and distinct from, in a strict sense, the outdated science. However, with this logic, he neglects that many scientific revolutions come out of an older paradigm wherein the scientific revolution often begins as a revision to old scientific standards. Ultimately, the lesson that one could draw from this analysis is that paradigmatic shifts are necessary in order for science to progress, but these changes cannot happen in isolation; paradigm shifts must occur (to some extent) within the historical contexts of normal science – the science that chronologically preceded it. In the case of AD, it was discovered within the context of degenerative cognitive disorders, but it was a significantly new discovery. Without acknowledging science's chronological development, the history of scientific advancement is lost. Historically, not only did the discovery of AD further advance the science of psychiatry, but it altered the scientific imagination in that it transformed the world of philosophy.

IV. A Philosophical Connection Between AD and Personhood

In order to learn more about ourselves in relation to reality and the world within it, we often try to answer scientific questions. If we accept that philosophy and science exist together, and that they are not incongruous disciplines, then we can further analyze the philosophical implications of scientific discovery. From a philosophical perspective,

personhood can be broadly viewed, but for the purposes of this paper, I will only examine a post-modernist view, since Kuhn is a post-modernist philosopher. “Any attempt to define the meaning of the notion of the person opens a window to a vast horizon of inquiry that raises many additional questions on a variety levels” (Torchia xi). In relation to AD, the notion of personhood is inextricably linked. How could a person with AD understand the world around them if what he/she knew at one point is no longer relevant to their current experience? Does the fact that these people go through their own paradigmatic shifts and their “demented” perception in fact their new, and only valid, truth? Or is it that the disease simply taints their understanding of reality, and their perceptions of reality are wrong? Perhaps these questions cannot be answered, but by using the notion of paradigm shifts as a way to explain the shift in our understanding of science and the world around us, it is fair to say that both the scientific and philosophical impacts of paradigm shifts are necessary for the growth of human understanding, potential, and personhood.

There are different points along the continuum of embryological development at which different writers claim the definition of “personhood” (Irving 1). Before that biological point, the human embryo or human fetus is considered only an “object,” a “thing” which may be used or dealt with according to the personal desires of a human person. After that particular biological marker event (conception, fertilization, birth, puberty, etc.) we suddenly have a human person, who is now considered a “subject” or an entity deserving protection against the interests, objectives, or desires of another human person (Irving 2). Therefore, the fundamental question underlying the notion of AD is when do these entities become undeserving of such protections, if at all? Does a person

lose their personhood if their cognition (another biological marker) begins to deteriorate or fail? In order to better analyze these questions, one should turn to an analysis of consciousness because it distinguishes humans from other non-human animals.

Although it is ambiguous as to what clearly constitutes a conscious experience, the underlying assumption among post-modernists, like Charles Taylor, is that "in the absence of self-consciousness (and, by extension, consciousness of others) one does not qualify as a member of the moral community" (Torchia 221). In this regard, "moral standing presupposes the social interaction of beings who enjoy rich inner life that allows them to enter a web of relationships carrying personal rights and generating corresponding duties to others" (Torchia 221). If this holds, then this is devastating to those with AD who cannot participate in social interactions or who cannot maintain responsibilities necessary to carry out personal duties. Postmodernist philosophers heavily emphasize overt characteristics as criteria of personhood (Torchia 223). "Postmodern assessments of personhood are ultimately based on how one is perceived by others in public forum, rather than on what one is by virtue of a nature, essence, or substantial form" (Torchia 223). Therefore, how individuals, and by extension, individuals with AD are perceived is the primary factor in determining their personhood.

The postmodern distinction between humanity and personhood plays a role in many contemporary bioethical debates regarding end-of-life decisions and the right to life to those deprived of higher consciousness (Torchia 223), such as individuals with AD. "The loss of rational capacity, autonomy, and conscious experience presupposes a corresponding loss of moral agency and the personhood on which moral agency depends" (Torchia 223). However, there is a difference, I hold, between the human personal life

and the human biological life. In other words, because a person loses his or her mental faculties does not mean that he or she is less of a person, and yet, politically and socially there are many instances where those with AD are maltreated, discriminated against, and underrepresented. This reinforces the notion that those with degenerative cognitive disorders comes a loss of moral agency and positive regard by others.

Therefore, the only solution is to promote scientific advancement and progress in order to enable those with AD to slow the rate of progression and continue to live competent lives. Here, a Kuhnian analysis would be essential. Once these discoveries are made (the current research being done as described in part II), then the paradigm could be reevaluated and tested. At this point, AD is in a state of normal science, after serving as a revolutionary shift within the field of psychiatry. If and when these discoveries are made, the paradigm may shift again. At this point, there is enough political inertia (eg. the "Walk to End Alzheimer's" campaign) to encourage fundraising for such research. If we are to be a forward-thinking country in regards to scientific research, then the tension between science and philosophy (or more specifically, biomedical ethics) will continue to grow.

V. Conclusion

Given the scientific and philosophical problems inherent in the positions which argue for the various biological marker events of "personhood," can we accept either the science that is used or the rationalistic or empiricist philosophical definitions of human beings versus human persons, which are incorporated into those arguments? Or is it even possible to reconcile the correct biological facts with a philosophical definition of a

human being or a human person? Assessing the discovery of AD from both philosophical and scientific frameworks raises the question, can philosophy and science truly coexist?

Accepting the truism that progress occurs when one replaces a theory that solves more problems, Laudan (one of Kuhn's biggest critics), in *Progress and Its Problems*, insists this truism is historically accurate only if the concept of "problem" is broadened beyond the empirical problem issues of traditional philosophers of science (70-90). If philosophical accounts of scientific progress are based solely on solved empirical problems, while anomalies and conceptual problems are not factored in, the picture of science that emerges fails to reflect the judgments of scientists about progress of their own disciplines. Despite weaknesses in Kuhn's argumentation, applying a Kuhnian analysis to the history of AD is appropriate because he argued for an episodic model in which periods of conceptual continuity in normal science were interrupted by periods of revolutionary science, which includes the formal discovery of AD.

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