

**From Animals to Humans: Niko Tinbergen's Venture into Autism Research and
Implications for Present-Day Understandings of Ethology**

by

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Nikolaas Tinbergen was a Dutch-born, Nobel Prize-winning animal researcher considered one of the founders of modern ethology. Best known for his “Four Questions”, an extant framework for analyzing animal behavior, Tinbergen made a drastic shift to childhood autism research in the last decade of his life. The guiding question for my research was thus: what motivated Tinbergen so late in his career to bridge the purported animal-human divide? In neither of the book-length biographies recounting the scientist’s career and life is there a clear explanation of what led to his pivot from animals to humans. The autism research cannot be dismissed so offhandedly despite the extensive backlash it received; nor did Tinbergen want it to be taken lightly, if the dedication of his Nobel Peace Prize speech to this work was any indication. Through my investigation of this question, I conducted archivally based primary source research, historical contextualization with secondary sources, and parallel assessment with cross-referenced figures. In my thesis, I argue historical events, coupled with personal turmoil, instilled in Tinbergen a deep-seated discontent with the state of his world. He channeled this discontent into attempting to cure childhood autism—a condition he considered a direct manifestation of a world in disarray. I anticipate my project will help elucidate how to contextualize the work of scientists and bridge an interdisciplinary gap between science and history. I believe scientific disciplines more informed by the humanities would make for more empathetic and cognizant scientists and professionals.

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Preface

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The entire BPhil process—the conception of my project, the months of archival research and analysis, the endless iterations of reading, thinking, and writing—was transformative. I conclude this project in awe of and deeply grateful for the support that allowed this experience to *be* transformative. I may emerge as smarter, but I undoubtedly emerge as much, much humbler.

1.0 Introduction

1.1 Early Life: A Biographical Account

Born in 1907 in The Hague, Netherlands, Nikolaas Tinbergen (known as “Niko” to his family and friends) spent many of his early years avoiding schoolwork and traipsing through the outdoors. Several decades later, he recalled in his Nobel lecture a childhood love for camping, bird watching, and grass hockey. He also recalled a deep and inevitable love for “Holland’s... unparalleled natural riches—its vast sandy shores, its magnificent coastal dunes, the abundant wildlife in its ubiquitous inland waters...” In his adolescence, Tinbergen took to drawing, sketching, and even photography, for which he possessed both dedication and immense talent.¹

Although reluctant, he was swayed by many adults in his life to pursue field studies professionally. While nature study was a bustling pastime for many Dutch youth in Tinbergen’s day, it was likely that his mentors recognized unmatched potential in Tinbergen.

Regardless, Tinbergen was loath to pursue these studies at the university-level for fear of it boring him. As it turned out, he skipped many labs and maintained his intellectual independence. His place was always in the field, watching animals in their natural habitats rather than watching them in captivity. Later, Tinbergen likened himself to a sort of hunter with his camera: he captured animals and their natural behaviors in various forms of media like photographs, film, writing, and in his own observations. Even when he began constructing the field of ethology with the Austrian

¹ This section drew largely on Richard Burkhardt and Hans Kruuk’s biographical accounts of Tinbergen.

animal researcher Konrad Lorenz, Tinbergen always undertook the practical work in the field, ceding the theoretical to Lorenz.

Tinbergen spent a good portion of his life building up the field of ethology alongside Lorenz. Tinbergen as an individual and his importance to the building of this field cannot be understated. He and Lorenz are considered the co-founders of this field. They considered themselves descendants of Darwin's: funnily enough, behavioral psychologists also considered themselves Darwin's descendants; however, this budding niche of ethologists wanted to distinguish themselves.

Looking at Tinbergen's earlier life, it would be nearly impossible to predict the trajectory of the latter half of his career. Even in the first two decades or so after the establishment of ethology, Tinbergen seemed resolute in reserving ethology for what it was first intended—studying animals, and only animals.

But Tinbergen, like all people, lived a continuous life. For documenting scientific history, it may be easier to separate his life and career into distinct eras or periods, but the Tinbergen complete with his thoughts, beliefs, and emotions, cannot be so easily separated into distinct eras. Some of these personal elements who made Tinbergen who he was were like the roots of a tree: they were lifelong, anchoring Tinbergen in place, and shaping many of his core positions and publications that sprouted in vastly different eras of his life.

1.2 Later Years

In the 1960s, the scientist began drafting a book titled *Man: Guinea Pig of Evolution* which discussed the deleterious effects of cultural evolution outpacing genetic evolution, effects that

reflected at both the societal and individual levels.² To this rift, he—with the wave of a hand—attributed social phenomena from as vast as war to as individual as mental disorders, including autism and depression. Despite the concerning premises of these claims, Tinbergen seemed intensely convicted of his argument. While the draft of this book is lesser well-known, the content of the book was shared in another forms: he echoed his arguments in correspondence with colleagues and in highly publicized lectures like the Croonian or the Nobel.

Along with other ethologists Karl von Frisch and Konrad Lorenz, Tinbergen was awarded the Nobel Prize in Physiology or Medicine in 1973. The official justification for their prize was stated to be “for their discoveries concerning organization and elicitation of individual and social behaviour patterns.”³ It may seem odd that the three (non-human) animal scientists’ prize fell under this category, but realistically, there was no other fitting category. In fact, the work of von Frisch, Lorenz, and Tinbergen helped push ethology onto the international scientific stage for the first time in a significant way.

Ostensibly, the three men were all ethologists; however, the content of their Nobel lectures differed greatly. von Frisch’s speech, titled “Decoding the Language of the Bee”, focused on analysis of various bee behaviors (notably, the “waggle dance”) that revealed how the insects communicate. Lorenz’s speech, titled “Analogy as a Source of Knowledge”, instead presented no specific animal research, but instead posited analogy as a mode of analysis for ethology. He also dedicated a short part of his speech to what he termed “cultural homology”, which he related to

² Nikolaas Tinbergen, Partial draft of *Man: Guinea Pig of Evolution*, 1974, Correspondence and papers of Nikolaas Tinbergen, MS. Eng. c. 3138, Bodleian Libraries, C. 141: Weston Library, Oxford.

³ Nikolaas Tinbergen, Ethology and Stress Diseases, Nobel Lecture, 1973, 2023, February 22nd: 32, Nobel Prize Outreach AB, nobelprize.org, <https://www.nobelprize.org/prizes/medicine/1973/tinbergen/biographical/>.

the inheritance of cultural knowledge across human generations. In contrast, in Tinbergen's own speech, he proudly championed these possibilities.

Tinbergen titled his speech "Ethology and Stress Diseases" and opened with a resounding pronouncement that the "old method of 'watching and wondering' about behavior...can indeed contribute to the relief of human suffering—in particular of suffering caused by stress."⁴ He proceeded to offer his interpretation of autism's diagnosis, causation, and treatment. He also briefly talked about the Alexander technique towards the end of his lecture, to offer an additional example of an application of ethology. There was practically no mention of any animal behavior work in his Nobel lecture.

To someone familiar with Tinbergen only through his ethology work (as is usually the case with people who have only studied Tinbergen's "Four Questions"), this late-career development is puzzling—perhaps even troubling. It seems as if only something drastic could have motivated Tinbergen to pivot in research interests so drastically, from animal behavior to early childhood autism. However, upon initial consideration, there is no one life event that can be pinpointed as responsible for Tinbergen's shift. In fact, decades earlier, a younger Tinbergen might even have been against his bridging of the purported animal-human divide. In neither of the book-length biographies recounting the scientist's career and life is there a clear explanation of what led to his pivot. However, the autism research cannot be dismissed so offhandedly despite the extensive backlash it received; nor did Tinbergen want it to be taken lightly, if the dedication of his Nobel lecture to this work was any indication.

⁴ Tinbergen, Nobel Lecture.

1.3 Making the Jump

The curious case of Niko Tinbergen, an animal ethologist turned autism researcher, calls us to scrutinize things beyond simply his base motivation. Questionable autism research aside, why is it so significant that Tinbergen made this jump? The significance itself is not necessarily subjective: even in the Nobel lecture, Tinbergen included justification for his place in autism research, as an ethologist, something that became a sort of custom for him in each talk and piece of writing that related to his autism work. And after all, are humans not animals as well? This line of questioning reveals a rather arbitrary divide between *non-human* animals and humans.

Examining Tinbergen's decades-long career certainly provides a resolute explanation for his seemingly odd shift in research focus. If we were to study Tinbergen's career in eras, rather than as one continuous life belonging to one man, it would be undoubtedly difficult to pinpoint where this shift in interest to autism research originated. However, if we *were* to examine his career, keeping in mind its continuity in of itself and with the outside world, it is easy to see that this interest began building decades before he formally made this shift.

Peering into Tinbergen's career also reminds us, specifically as scientists, to be critical of the ideas we implement, as there was most definitely a connection between Tinbergen's earlier work and his controversial joint work with his wife in autism. Perhaps most importantly, this examination provides insight into what constitutes this very arbitrary yet almost divide that appears time and again in biology, anthropology, and history.

2.0 How did World War Two affect Tinbergen's trajectory?

2.1 The Far-Reaching Effects of War

Some of the most famous photos taken of Konrad Lorenz depict him being followed by a group of greylag geese that has imprinted on the scientist. These photos were taken by Tinbergen at Altenberg in the spring of 1937, a period which cemented the partnership and friendship of these two scientists. In many ways, this time presented a deceiving lull in their lives before the war permanently fractured their relationship.⁵

Despite their staggering contributions to science, neither of the two men could have predicted—nor prevented—the way history would begin to unfold all around them. In late 1938, Tinbergen made a trip to the United States to rally more support for ethology. In 1939, he returned to Holland to lecture at Leiden University. The very next year, the Germans occupied Holland. In this same year, Tinbergen began corresponding with Ernest Mayr in English rather than German—in which they had corresponded up until 1939, and in which Tinbergen was also fluent. He also wanted out of the German science scene, going as far to fully cut off relations with many of his German colleagues, including Lorenz.

At the same time, Tinbergen was of a mind to preserve as much pre-war work as possible: in his correspondence with Mayr preceding the war, Tinbergen was already laying out a long-term vision for the field of ethology beyond the war. In this respect, he was more far-sighted than many

⁵ Like the preceding section, this one drew largely on Richard Burkhardt and Hans Kruuk's biographical accounts of Tinbergen.

of his colleagues. He wrote to Mayr of plans to hold an international symposium on animal behavior following the war. He also remarked on the importance of reconstructing cooperation. It may seem paradoxical that Tinbergen was expressing certain ideas and acting contrary to these ideas. This was Tinbergen attempting to compromise: he could not sacrifice his principles, but he could also not sacrifice his science. Although he was willing to stall ethology's progress for a few years, he still cared too much about it to fully relinquish the discipline over what he deemed personal strife.

Perhaps there were other small acts of defiance like these that have escaped notice in the face of Tinbergen's eventual imprisonment at the Beekyliet internment camp. On September 9th, 1942, Tinbergen formally resigned from his position as lecturer at Leiden University and was subsequently arrested and imprisoned. The university had closed earlier that year in protest of Jewish faculty being fired. In fact, Tinbergen was offered a way out by an acquaintance—after all, he would be leaving behind a wife and small children—but he staunchly refused. He was imprisoned for two years.

Lorenz, with whom Tinbergen had enjoyed a years-long friendship and professional partnership, embraced the Nazis' rise to power and believed they could be beneficial for his career. His work during this period had definite Nazi underpinnings of race hygiene, aversion to race mixing, and eugenics as a resolution. In one of his publications, Lorenz even compared the “degeneration of instinctive behavior in domesticated animals” to a similar decline in the “instinctive behavior patterns of humans in civilized society.”⁶ Decades before Tinbergen made

⁶ Richard W. Burkhardt, *Patterns of Behavior: Konrad Lorenz, Niko Tinbergen, and the Founding of Ethology* (Chicago: University of Chicago Press, 2005), 249.

his own jump to childhood autism from animal behaviorism, Lorenz was here pushing the bounds of ethology, toying with ethological ideas in association with humans.

Hundreds of miles away in Beekyliet, Tinbergen continued writing, and wrote “Inleiding tot de diersociologie”, which introduced the “good-of-the-species belief”; he also made a small book of illustrations for his children. His continued efforts to write and illustrate served as additional evidence of this compromise he has forged with himself, trying to preserve both his morals and scientific work. Besides, it goes without saying that his internment came with great personal costs for Tinbergen, who never quite regained his footing after emerging from the hostage camp. While he was away, Tinbergen’s children became “abstractions in his mind.” Even after he was reunited, Tinbergen was permanently alienated from his children and was unable, in the decades following, to close this war-induced rift.⁷

2.2 Post-War Years: Rebuilding

Neither did Tinbergen’s personal and professional relationships that had been derailed by the war automatically recuperate following its end. In the years immediately following the war, Tinbergen harbored an immense amount of resentment towards Lorenz, which barred them from professional collaboration and spending time in each other’s company. It was not until July of 1949 that Tinbergen publicly forgave Lorenz, but continued to harbor private hope that Lorenz would renounce his Nazi ideals. This hope was never realized; nor was Tinbergen’s resentment

⁷ Hans Kruuk, *Niko's Nature: The Life of Niko Tinbergen and His Science of Animal Behaviour* (Oxford: Oxford University Press, 2004).

fully resolved. Tinbergen even made a public display of anger when Lorenz shared his Nobel Prize—it was to this extent that Tinbergen was affected by the war, and understandably so.

In his autobiography, Lorenz wrote that his own experience being a prisoner of war, as well as Tinbergen's experience, "made no difference whatsoever."⁸ This was blatantly untrue for Tinbergen, who was now an outsider at home, lagging a few years, and a man who became more interested in his students than his family. Perhaps his lack of control over personal circumstances and overall emotional state led to the urge to compensate by throwing himself into his work. The post-war period was indeed an especially productive, fast-paced time for him; Tinbergen's biographers affirm that his self-confidence revolved around his professional life. In this way, it turned out the Second World War cemented the centrality of work in Niko Tinbergen's life. His commitment to work was demonstrated in his efforts to write at Beekyliet and further echoed by his increased output following the war.

In a persistent, unwavering commitment to ethology, in 1946, the scientist began rebuilding international ties through a journal titled *Behavior*. In 1947, owing to psychological effects from the war and an inability to focus on ethology, Tinbergen left Holland and moved his family to the U.K. He had begun looking for positions years before, driven by the need to establish a foothold for ethology in the English-speaking world. His colleagues in Holland were embittered by this move—many saw it as a betrayal, evidenced by the fact that nobody came to see Tinbergen off at his departure. In the end, there were too many personal factors at play for Tinbergen; we can now say that his move to Oxford was really what catapulted him to historical status. In 1951, he published "On aims and methods in Ethology", which featured arguably Tinbergen's most important contribution to the broader fields of modern-day ecology and biology: the "Four Whys".

⁸ Burkhardt, *Patterns*.

The Second World War concluded decades before Tinbergen started explicitly writing about the animal-human divide, let alone childhood autism. However, this period of Tinbergen's life allows for critical contextualization of the scientist. Perhaps not everyone was or chose to be as drastically affected as Tinbergen, but no individual was unaffected the war. It is possible to speculate the branches of Tinbergen's life that find took root here, in the post-war period. For instance, the war might have played a part in the debilitating depressive episodes Tinbergen suffered throughout the later decades of his life. More tangibly, the postwar period indeed shaped his work ethic—not only did Tinbergen work through the war, but later in life, he also never retired and worked until he physically could not. At an intellectual level, Tinbergen's personal experiences through the war may have very well influenced his later fixation on human aggression, which he viewed as a manifestation of human "disadaptation." Indeed, Tinbergen considered autism another manifestation of this social phenomenon.

3.0 The Critical Decade

3.1 Lectures at Oxford

In the decades prior to his ultimate switch to autism research, Tinbergen became increasingly concerned with the state of the world. For several years beginning in the late 1960s, Tinbergen lectured for a first-year course on animal behavior at Oxford. We witness Tinbergen solidifying his ideas on what he termed the “human predicament” through these lectures; he later echoed these same ideas in both his Nobel and Croonian lectures.

In an introductory lecture in 1970, Tinbergen described the dangerous circumstances humankind has run up against. He implied that our success may very well be our downfall, as “[m]an has, through technological achievements, done more than survive in his environment, he has progressively and in an accelerating tempo changed this environment.” Therefore, the only possibility to “remedy this highly dangerous human situation...will [be] to control human behavior.”⁹ Tinbergen did not explain ethology’s role in this lecture, but it was clear that it was appropriate here as a potential countermeasure.

In another lecture for the same course in 1971, Tinbergen mentioned that additional consequences of cultural evolution outpacing its genetic evolution included “greatly increased density; anonymous society; depletion and pollution (including social pollution); [and] the problem of war.” For Tinbergen whom the specter of war had loomed over since his time in Beekyliet, war was perhaps the most compelling example of human “disadaptation.” The

⁹ Nikolaas Tinbergen, First-year lecture course on animal behavior—for the new course “The Human Sciences”, 1970, Correspondence and papers of Nikolaas Tinbergen, MS. Eng. c. 3134, Bodleian Libraries, C. 55: Weston Library.

identification of war as a behavior was most pronounced when Tinbergen suggested that “future historians [might] consider organised mass-killing as a temporary deviation which evolved some 10,000 years or more years ago and stopped at about the present time.”¹⁰ He made this ostensibly unsubstantiated claim as part of a book draft titled “Man: Guinea Pig of Evolution.” Tinbergen’s thoughts on the “crisis...affect[ing] the Earth as a whole” and his analysis of war as a form of “disadaptation” is best understood through this draft, despite it being unfinished and unpublished.¹¹

3.2 Man: Guinea Pig of Evolution

In the early 1970s, the scientist outlined and laid out the groundwork for several chapters of this book but never finished nor published it—presumably, he and his wife Elisabeth Tinbergen became increasingly enraptured with autism work and abandoned this other project. Tinbergen framed the book as a collection of essays in his draft of the foreword. It was to include the Croonian Lecture, “Ethology in a Changing World,” “On War and Peace in Animals and Man,” an essay on autism, and two additional essays on “child rearing.”

Tinbergen considered the gravity of the “human predicament” as justification for his discipline-hopping. In one version of his foreword, Tinbergen wrote that he “make[s] no apologies for having ventured far outside my own field of first-hand research, nor for claiming that [he] consider[s his] approach to be potentially more helpful than the contributions made by those who are not quite at home in ‘whole animal biology’.”¹²

¹⁰ Nikolaas Tinbergen, Chapter draft of *Man: Guinea Pig of Evolution*, “Optimism and Realism”, 1974, Correspondence and papers of Nikolaas Tinbergen, MS. Eng. c. 3138, Bodleian Libraries, C. 148: Weston Library.

¹¹ Tinbergen, Partial draft of *Man: Guinea Pig of Evolution*.

¹² Tinbergen, Partial draft of *Man: Guinea Pig of Evolution*. [1].

Moreover, Tinbergen justified the inclusion of the essay on autism, an “updated version” of his and Lies’ 1972 publication, as an “illustration of how animal ethologists can fruitfully apply their approach and methods to specifically human, psychiatric problems.”¹³ His inclusion posited autism as a problem that ethology could solve. However, in the context of the large-scale changes that afflicted Tinbergen’s world, autism was far from an isolated pathology. He affirmed this himself when he wrote that autism “illustrates one of the ways in which Western society can damage its citizens of the future.”¹⁴ While not mentioning autism explicitly, Tinbergen speculated in a related draft that “in the wake of famine, epidemics, social pressures and wars, large numbers of people will be somatically and mentally damaged for life.”¹⁵ These excerpts make Tinbergen’s stance exceedingly clear: autism was but one manifestation of larger-scale, global issues trickling down to the community and individual levels.

Indeed, it would have been difficult to imagine Tinbergen homing in on autism given his ardor for resolving the global “crises”: in this draft, he established rather lofty goals for resolving human “disadaptation.” He discussed ideas for reforms that would be impossible without complete international cooperation. Without said cooperation, Tinbergen’s suggestions of “symptom treatments [for]...halting population growth; ensuring a fairer distribution of the necessities of life; reduction of many forms of over-exploitation and tapping...” were just abstract and hand-wavey suggestions. He acknowledged that he was “advocating a swing of animal ethology towards a more applied course” and that such global action would be the “task of all the sciences.”¹⁶

¹³ Nikolaas Tinbergen, Foreword draft of *Man: Guinea Pig of Evolution*, 1974, MS. Eng. c. 3138, Correspondence and papers of Nikolaas Tinbergen, C. 146, Bodleian Libraries, Weston Library. [2].

¹⁴ Tinbergen, Foreword draft of *Man: Guinea Pig of Evolution*. [2].

¹⁵ Tinbergen, Chapter draft of *Man: Guinea Pig of Evolution*, “Optimism and Realism”. [18].

¹⁶ Tinbergen, Chapter draft of *Man: Guinea Pig of Evolution*, “Optimism and Realism”. [26].

In describing Tinbergen's mental and professional circumstances in the 1960s, Hans Kruuk writes that the scientist not only felt his scientific abilities waning, but increased concern and guilt about mankind's fate.¹⁷ Where Tinbergen directed "missionary zeal" towards a cause—a total overhaul of society to account for cultural "disadaptation"—he believed he could justify for its apparent benefits for mankind, he received overwhelming backlash and was "hit by disapproval in a way he had never experienced before." For example, he was slated to lecture at Simon Fraser University in British Columbia, Canada in 1969. His scheduled lecture incited rioting among students, some who even called him a "Nazi." Deeply shaken by the backlash and struggling with personal health issues, Tinbergen and his wife Lies became even more absorbed into themselves and their joint personal project: childhood autism—namely, its cure.

Perhaps because of the backlash he received, Tinbergen repackaged his ardor into something more palatable. Alternatively, his switch may have also been rooted in the realization that he preferred and was more likely to find success working at the level of individuals. Despite the public response to his ideas, Tinbergen, whose self-identity was largely rooted in his work, would never be able to sit idly by.¹⁸ He may have redirected his energies, but his ideas and conceptions of human "disadaptation" remained fundamentally the same. Thus, as he ventured deeper into autism research, his construction of autism was heavily influenced by these earlier ideas.

¹⁷ Kruuk, *Niko's Nature*.

¹⁸ Marga Vicedo, "The 'Disadapted' Animal: Niko Tinbergen on Human Nature and the Human Predicament," *Journal of the History of Biology* 51, no. 2 (2018), <https://www.jstor.org/stable/44980383>.

4.0 The Croonian Lecture

On May 18th, 1972, Tinbergen delivered the prestigious Croonian Lecture at the Royal Society in London. The content of his lecture pulled in a lot of ideas that he had been writing and lecturing about for years beforehand. From comparing this lecture to his earlier correspondence at the Bodleian, it is apparent Tinbergen finally solidified his claim as an ethologist to human matters. Each year following this culminating lecture, Tinbergen retreated further and further from the field he helped to build into the complex area of childhood autism research. Thus, in many ways, we can consider the Croonian Lecture as a crossroads—one where we can begin tracing the paths that led Tinbergen to this point and the ones that led him away.

4.1 The Ethologist's Role

One of the scientist's overarching goals for his lecture was to define the ethologist's role in resolving some of the problems confronting his present-day world. He states this at the beginning, saying he wants "to sketch how an animal ethologist studies adaptedness of behaviour; how this makes him look at some problems facing modern Man."¹⁹ With this, the lines between non-human and human studies begin to blur. Tinbergen is not suggesting that ethologists should apply their knowledge to man, but rather explicitly laying out the groundwork for how this interdisciplinary work should proceed.

¹⁹ Nikolaas Tinbergen, "The Croonian Lecture, 1972: Functional Ethology and the Human Sciences," *Proceedings of the Royal Society of London. Series B, Biological Sciences* 182, no. 1069 (1972), <https://www.jstor.org/stable/76161>.

Early on, he makes a nod to his predecessors, including some of his own colleagues, who crossed this bridge ahead of him. He describes the inadequacy of any analyses, like the one he is about to embark on should, should they lack a certain perspective—“any comparison of the behaviour of Man with that of animals is off to a false start unless the distinction between genetic evolution and cultural evolution is clearly seen.”²⁰ Intuitively, Tinbergen’s arguments seem to make sense, but they lack the sort of substance that would truly make them convincing. They instead incorporate the fervor and borderline desperation of a man who exhibits an evident passion for what he lectures about, a sentiment he hopes those listening might adopt.

4.2 Human “Disadaptation”

One schematic Tinbergen included in the manuscript of his Croonian lecture represented “the difference between genetic and cultural evolution...[and] the rapidly increasing demands imposed upon individual adjustability in Man.”²¹ While the graphs do effectively summarize Tinbergen’s main talking points, they do not accomplish much beyond that. What can be said of schematics that are not generalizable, that are tailored with the express purpose of propping up one’s argument? Would this schematic be significant without the context of Tinbergen’s lecture?

The scientist rounds out his discussion of the “disadaptation of Man” with the following conclusion:

Adaptedness of behaviour, and programming for such adaptedness are tasks facing all animals. Comparative functional ethology is concerned with these very issues, and a brief

²⁰ Tinbergen, "Croonian."

²¹ Tinbergen, "Croonian."

excursion into this field might at least help us to see some aspects of the human predicament a little more clearly.²²

Seemingly satisfied with this connection, Tinbergen embarks on a rather lengthy detour into a realm he is clearly more comfortable and well-versed in. The focus of this thesis is not necessarily Tinbergen's earlier animal work, but it is important to recognize the wealth of ethology research he embeds into this lecture. He rattles off example after example of how ethologists have approached behavioral studies spanning across numerous species of birds. He delves into such careful detail of individual species that we almost forget how he began the lecture: with the promise of showing the audience how to apply ethology to Man.

As he begins to close out his lecture, before circling back to applications to Man, Tinbergen appears to take one final detour in a sketch of "early Man". At one point, he characterizes our ancestor as "a bipedal inhabitant of a more open habitat, one richly provided with an under-exploited food supply."²³ He also describes, from fossil evidence, "a switch from a vegetarian diet to that of a hunter-gatherer" accompanied by "early cultural developments such as tool-making and the use of fire."²⁴ Admittedly, this portrayal of early Man feels stilted and odd: it stands in stark contrast against the landscape of his overall lecture. The detached language with which Tinbergen uses to talk about "ancestral Man" is the same, detached language he equipped in his earlier descriptions of avian species—as if "ancestral Man" is as separate from us as the various birds he mentioned.

Simultaneously, before beginning this reconstruction, Tinbergen remarks that "as we go along we can check, as I did with the Kittiwake and the Oystercatcher, whether such a sketch

²² Tinbergen, "Croonian."

²³ Tinbergen, "Croonian."

²⁴ Tinbergen, "Croonian."

would make functional sense...”²⁵ In employing roughly the same structure of analysis with humans as with non-human animals, Tinbergen stakes out a critical implicit argument: from a scientific standpoint, man is effectively no different from the birds he studies. How can it be, then, that Tinbergen both posits “ancestral Man” as someone far removed while employing “ancestral Man” as the functional link between ethology for animals and ethology for us?

I do not think that there is a satisfying answer to this question because Tinbergen himself did not have an answer, not in this lecture and not in any of his other writings. Furthermore, I do not think Tinbergen quite knew such a disquieting contradiction existed in his lecture. His objective, of course, differed from our own: he was less concerned with the technicalities of his methods, and more concerned with proving the legitimacy of ethological applications to human problems. The scientist even remarks that “[i]t is not necessary here to work out this reconstruction in more detail”.

4.3 Contextualizing the Croonian

I consider this lecture useful for this thesis for a few different reasons, but perhaps not for the ones Tinbergen envisioned. One way to view the Croonian lecture is as a public concession: he has changed his mind about the limits of ethology, about what this discipline can and cannot do. Tinbergen’s career spanned many decades and for many of those, he was highly averse to drawing comparisons between human and non-human species. There were several instances in

²⁵ Tinbergen, "Croonian."

which his opinion on this was apparent—both in his words, and in him disagreeing with his colleagues.

For instance, at the founding of ethology, Lorenz and Tinbergen considered themselves descendants of Darwin, meaning that it was highly likely they read Charles Darwin's "Descent of Man". To rebuff Darwin, someone whose work was so crucial in shaping the scientific field Lorenz and Tinbergen were raising up, meant they imbued this belief in shaping the field of ethology, too. The concerns Darwin voiced in this text were centered in Julian Huxley's worldview. Huxley was unapologetic in adopting a psychological perspective in interpreting animal courtship behavior. As Tinbergen was in regular correspondence with Huxley, the former was certainly exposed to Huxley's ideas and yet refused to adopt similarly anthropomorphic lines of thinking. In his own words, Tinbergen wrote that "[t]he non-biologist is more inclined than others to stress that 'Man is unique'. Scientifically speaking, we have seen that each species is unique...Yet Man shows behaviour that seems to set him off more than any other species..." Evidently, these initial ideas eventually eroded to give way to those presented in the Croonian lecture.

Equally as important to recognize is that Tinbergen foreshadows with the Croonian lecture an application of ethology he parallels in a significant way later: the study of autistic children. There are few mentions of autism (or, as he also calls it, Kanner's syndrome) in this lecture; however, we know in 1972, Tinbergen is already thinking and working on a supposed cure with his wife Lies. We must then also read this lecture as if Tinbergen is anticipating soon unveiling his work on autism.

5.0 Tinbergen's Construction of Autism

As Tinbergen narrates in his 1973 Nobel lecture, autism “is a set of behavioural aberrations which Leo Kanner first described in 1943.” However, in 1973—the year Tinbergen gave his Nobel lecture—the world was still learning about autism. It was partly for this reason that Tinbergen’s construction of autism was far from infallible. His construction was shaped by his background as an ethologist, his self-selected-for colleagues in the field of autism, and above all, his personal convictions. Whether or not Tinbergen’s work on autism can be considered viable is a separate matter, but here again, the practice of science is inextricable from the scientist. While Tinbergen’s autism research is not well-regarded, to understand his venture into this discipline, it is critical to have a base understanding of what he believed to be true about autism.

5.1 Diagnosis

In his Nobel speech, Tinbergen described “how crippling this affliction is” for “these unfortunate children [with autism].” Even then, it was known that autism manifested on a spectrum, as Tinbergen accordingly described autism involving “[i]n various degrees of severity...a total withdrawal from the environment; a failure to acquire, or a regression of overt speech, and a serious lagging behind in the acquisition of numerous other skills; obsessive preoccupation with a limited number of objects; the performance of seemingly senseless and

stereotyped movements; and an EEG pattern that indicates high overall arousal.”²⁶ Tinbergen explained that there existed no set of official diagnostic criteria by which to determine whether a child was autistic. The ethologist observed that “doctors have been saying to the parents...little more than: ‘You are quite right; there is something wrong with your child’.” He projected a table put together by American psychologist Bernard Rimland which demonstrated that a diagnosis was essentially at the arbitrary discretion of the treating physician. In this table, Rimland obtained first and second opinions about children with severe behavior disorders with very low rates of consensus.

Tinbergen seemingly contradicted himself by then pointing out an exception: “And yet, if we use the term autism in the descriptive sense of ‘Kanner's syndrome’, it does name a relatively well-defined cluster of aberrations.”²⁷ In a separate, earlier autism colloquium he spoke at in Tavistock in 1972, Tinbergen listed several Creak-O’Gorman’s²⁸ “main observables” which included, among other traits: “impairment of relationships with people,” “excessive, diminished or unpredictable response to stimuli,” and “hyperkinesis or immobility, ritualistic mannerisms.”²⁹ It was likely due to time constraints and situational considerations that Tinbergen omitted such a list from his Nobel lecture. However, I think Tinbergen also wanted to demonstrate the lack of credibility of the “establishment”—something that, in his autism work, he adamantly dismissed again and again. Through this dismissal, it followed that Tinbergen and other “outsiders,” as he

²⁶ Tinbergen, Nobel Lecture.

²⁷ Tinbergen, Nobel Lecture.

²⁸ Mildred Creak and Gerald O’Gorman were British psychiatrists.

²⁹ Lecture by Tinbergen at the Tavistock Autism Seminar. Nikolaas Tinbergen, Lectures and manuscripts summarizing autism, 1972, Correspondence and papers of Nikolaas Tinbergen, MS. Eng. c. 3147, Bodleian Libraries, D. 55: Weston Library. [2].

referred to himself, would be encountering a more level playing field where their opinions held greater legitimacy.

5.2 Causation

In personal correspondence and lectures, Tinbergen’s discussion of diagnosis was often eclipsed by his discussion of causation. Tinbergen’s fixation on causation was driven by his ethological framework for thinking and that this area was particularly contentious. This will be discussed in the following section. He frequently clashed with others studying childhood autism over personal views of what led to the disorder in children. In his Nobel lecture, he notably downplayed his personal stakes in this argument and framed the opposing sides in much more neutral language. He described “the usual nature-nurture controversy,” where experts largely split into two camps: the first camp “[held] that [autism was] due either to a genetic defect, or to equally irreparable ‘organic’ abnormalities...” and assert that autism was not causally related to parenting. The second camp were “inclined to ascribe at least some cases of autism to damaging environmental causes—either traumatising events in early childhood, or a sustained failure in the parent-infant interaction.” Tinbergen modestly admitted that if this second claim “were even partially correct, the prospect for a real cure would be brighter of course.”³⁰

Just months before he delivered this lecture, in late 1972, Tinbergen put together another document with the note that it was “not to be shown to parents if there [was] the slightest chance of eliciting guilt feelings in them.”³¹ Here, Tinbergen wrote with much less restraint. He even made

³⁰ Tinbergen, Nobel Lecture.

³¹ Lecture by Tinbergen on autism. Tinbergen, Lectures and manuscripts summarizing autism. [16]

an additional jab at “professionals,” who he believed were so focused on the “theory-biased” that they failed to notice what was “pretty obvious” to ethologists. Tinbergen explored, in a fair amount of detail, six causes: parental (according to him, “usually maternal”) positive rejection, preoccupation of the mother, intrusion of parents in a child’s play, parents being overly restrictive, lack of encouragement of horseplay, and parents being too demanding with academics.

How could it be possible that Tinbergen’s stance changed so drastically over the course of just about a year? Simply put, it is not possible: what changed was the forum in which Tinbergen advocated his views. At the beginning of this “confidential” document, Tinbergen related that “[s]ince "Early Childhood Autism - an ethological approach" was published, [he and Lies had] received a number of comments from pediatricians, psychiatrists and psychoanalysts [from several countries].”³² This paper was published jointly by the scientist and his wife Lies; its publication was the first occasion that pushed the Tinbergens into the public eye for their autism work. According to Tinbergen, comments were either rejecting or accepting of the claims they laid forth in their paper. When Tinbergen emerged from his bubble with this initial publication, he realized that his argument was rather unpopular. I believe his cautious framing in the Nobel lecture was an indication of testing the waters on the global stage (explicitly, he did not associate himself with either “camp” of experts) rather than changing his mind about causation.

Throughout his venture into autism, Tinbergen struggled greatly with criticism of his work. In later years, his correspondence reflected feelings of defensiveness and indignation when receiving this backlash that is not yet present in his writing at the start of the 1970s. For example, a decade later in 1982, he wrote to Dr. Lolas that “even our factual reports...were simply not accepted, which I personally find offensive, but such is life.” Later in the letter, he called Britain

³² Tinbergen, Lectures and manuscripts summarizing autism. [16].

“a bulwark of conservatism” regarding the immense backlash he received in presenting his “cure” for autism.

5.3 A Cure

Just as with Tinbergen’s stance on causation, in his Nobel lecture, he was more conservative in his discussion of the treatment of autism. Even though in his speech he does not even assert that a cure is possible, earlier correspondence with psychiatrists suggested he genuinely believed otherwise. In 1970, Dr. George Stroh, psychiatrist-in-charge at High Wick Hospital, responded to Tinbergen, thanking him for sending a draft of the “ethological study on normal and autistic children” the Tinbergens would go on to publish in 1972. He suggested a “minor” revision, explaining that he did not think Tinbergen should “claim that [Stroh’s] study was “strikingly” successful.” While Stroh admitted “one hoped [a treatment] would emerge” from the study, he clarified to Tinbergen that it was “not aimed...to develop a form of treatment...”³³

In the same Tavistock colloquium that he rattled off several diagnostic criteria, Tinbergen went so far as to propose a possible treatment to try out with autistic children. In line with his argument that autistic children “have been environmentally intimidated,” he proposed that “perhaps even curing by...improved mothering...may well be possible...” Though he does not mention therapies by name in the Nobel lecture, Tinbergen acknowledged that his and Lies’ proposed “therapies which, with few exceptions, had not so far been tried out...[but] where these

³³ George Stroh, Correspondence addressed to Nikolaas Tinbergen, 1970, Correspondence and papers of Nikolaas Tinbergen, MS. Eng. c. 3144, Bodleian Libraries, D. 1: Weston Library. [14].

treatments have been applied, they are leading to highly promising results...” He did not provide evidence to substantiate his claims.

Throughout the 1970s, and really, throughout his autism stint, Tinbergen never relinquished control over any of his ideas—no matter how unpopular or controversial. The point about the existence of a cure for autism was a matter of great significance for Tinbergen. In a text of a lecture that he drafted but never ended up delivering, likely due to health reasons, Tinbergen scoffed that the idea that “autistic children are “ineducable”—[that] they cannot be cured” was an opinion, “not necessarily [a] final [truth], however widely [this idea is] taught and accepted.”³⁴ His eventual crowning treatment, which he claimed could cure autism, was known as “holding therapy.” It was developed by American psychiatrist Martha Welch. She and Tinbergen became acquainted around 1978; they quickly grew to be close friends, as evidenced in later correspondence by extensive discussion about both work and personal matters.

According to Tinbergen, Welch “argued...that autistic children could recover completely if they were taken back so to speak to “square one” in their development and made to start their affiliation anew as if they were babies.” Tinbergen mentioned that there were a few variations of the therapy, depending on who was doing the holding. Zaslów and Allan “originally made the therapist do the holding,” whereas Welch “insists on the mother or...the principal attachment figure,” which the Tinbergens also believed was the correct way to proceed.³⁵

Interestingly, Welch practiced “forced holding” with mothers of both autistic and “other emotionally damaged” children, indicating Welch and Tinbergen’s expansive view of the therapy they fervently promoted. He described the therapy itself in rather simple terms—mothers needed

³⁴ Nikolaas Tinbergen, A ten years’ study of Early Childhood Autism and a new, successful therapy, 1982, MS. Eng. c. 3147, Correspondence and papers of Nikolaas Tinbergen, D. 70, Bodleian Libraries, Weston Library. [3].

³⁵ Tinbergen, Nobel Lecture.

to take their children onto their laps, “holding them firmly but lovingly, stroking them, kissing them, speaking to them in a reassuring voice, singing and joking with them, rocking them—all in a clearly loving way.” The child must not be allowed to “struggle himself free...[he] must also be forced to embrace [his] mother in return.” Around 1980, the Tinbergens “went to New York and observed [Welch] at work...” and Tinbergen recounted that they saw that “forced holding did indeed work.” In a later revision, he tacked on that the couple “have since seen this confirmed in many other children.”³⁶

He argued that holding “made eminent biological sense” because it addressed the heart of the issue: the originally damaged mother-child relationship. He encouraged persevering despite difficulties that holding may present, as other methods were “far less effective...[and could] even be counterproductive.” For Tinbergen, “[a] healthy mind cannot develop without a healthy emotional infrastructure.”³⁷

³⁶ Tinbergen, Nobel Lecture.

³⁷ Tinbergen, Nobel Lecture.

6.0 The Four Questions

In his 1963 paper, “On aims and methods in Ethology,” the scientist aimed to describe behavior as “characteristics,” just as animals may have “structural and physiological characteristics.” He also acknowledged the complexity of behavior and that it is “something vastly more complex than the types of movements...the usual objects of physiological study.”³⁸ As demonstrated previously, Tinbergen constructed autism as a collection of behaviors. This section will elucidate how (and a bit of why) he did so: through his famous “four questions” that he developed for thinking about nonhuman animals.

6.1 Causation

The first question that Tinbergen addressed in his paper “On aims and methods in Ethology” was the matter of causation. For instance, behavior regulation is only “controlled by the external world” to a certain extent; there are other internal influences that must be considered. With this question, Tinbergen aimed to map the innate and environmental causes and stimuli that resulted in animal behavior. This prong can therefore be thought of as the bridge between the question of evolution, which is generally external to the subject, and the questions of function and development, which are moreso subject-specific descriptors.

³⁸ Nikolaas Tinbergen, "On aims and methods of ethology.," *Ethology* (“*Zeitschrift für Tierpsychologie*”) 20 (1963).

Interestingly, Tinbergen cautioned in this earlier paper against the “subjectivist, anthropomorphic undertones” that ethologists were prone to adopting when discussing causes of animal behavior. He lamented that “Ethology [had] not yet completely succeeded in freeing itself from subjectivism...” Tinbergen clearly believed at the time that a clear distinction between non-human animals and humans was critical to propelling the field forward. As has been discussed extensively, his later position was, in practice, entirely contrary to his previously held beliefs.

In *‘Autistic’ Children: New Hope for a Cure*, Tinbergen applied causation following two key avenues. Along the first avenue, he investigated the stimuli that elicit certain behaviors from children with autism, particularly when they may be encountering a new person or situation. He classified their behavior as either “approach” or “avoidance”, two “major functional systems...controlled by...internal conditions...and external events.” He described the relationship between the internal and external as “the stronger the [internal] motivation is, the weaker need the external stimulation be to trigger off the behaviour.”³⁹ Just as indicated in “On aims,” Tinbergen indicated that behaviors observed in children with autism were not solely controlled by external influences—internal factors were also involved. In fact, the two were (according to him) connected through some sort of compensatory mechanism.

The scientist described that on “many occasions,” an autistic child would fail to “respond to stimuli that normally would make him approach,” stimuli that neurotypical children might react to.⁴⁰ He suggested that even as internal motivation was kicking behavior into the “approach” gear, other factors like a child’s “anxiety” might “[prevent] him from actually acting on” that internal

³⁹ Nikolaas Tinbergen and Elisabeth A. Tinbergen, *‘Autistic Children’: New Hope for a Cure* (London: George Allen & Unwin, 1983), 32.

⁴⁰ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 33.

motivation.⁴¹ A specific example Tinbergen claimed to have observed was “incessant turning round on the spot or twirling [characteristic of] many autistic children... a successive combination of the first stage of approach and the first stage of turning-round-and-walking away.”⁴² This example followed his earlier explanation that animals he had observed “lived in motivational states...very comparable to those...observed and analysed in autistic children.” According to Tinbergen, just like in human children, animals had been “repeatedly, often continuously, subjected to stimuli that drove them to” either approach or avoidance.⁴³ A little later in the same chapter, he brought up an additional example of movements that transcended species lines. He wrote of “rocking to and fro...[as] comparable to the pendulum movements so common in many animals.” He analyzed the pendulum movement as the oscillation between “intentional approaches and intention withdrawals.”⁴⁴

Tinbergen employed parallel and reciprocal assessments of humans and nonhuman animals as confirmation for his hypotheses surrounding autistic children, and vice versa. This system of evidential support established by Tinbergen implies he effectively treated behaviors of autistic children and wild animals as equivalent.

Along the second avenue, he applied causation to differentiate neurotypical and autistic populations. Extending his explanation of rocking behavior commonly observed in autistic children, Tinbergen wrote that this category of behavior could also be observed in the neurotypical. He explained how an individual in a pub brawl might take “a few steps forward toward another hand then a few steps back, and perhaps even [repeat] this a few times.”⁴⁵ In the minds of the

⁴¹ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 67.

⁴² Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 84.

⁴³ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 83.

⁴⁴ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 85.

⁴⁵ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 85.

audience, such behavior would appear perfectly normal. It would be unreasonable for an observation of this behavior to warrant a suggestion that the individual might have autism. Therefore, the “differences between ‘normal’ and ‘autistic’ behaviour are often differences of degree” in causation—or, as I will touch on soon, also differences of degree in development.

It is therefore reasonable to assume that Tinbergen conceptualized causation as a continuum: the same stimuli will elicit a continuum of behaviors from a single population. We must then adopt an approach based on “relatives” to examine these behaviors as there are no absolutes. Understanding this, Tinbergen felt secure introducing animals into this continuum as there was really no reason not to—they served as but another benchmark for comparison. However, Tinbergen’s continuum is deceptively progressive: while it may appear as though his views could fall in line with present-day advocates of neurodiversity, he only set up this continuum because he believed in a cure for autism. If autism was a collection of behaviors, he considered the behavior of children without autism as the norm, to figure out the ways children with autism deviated.

For him, these deviations could be thought of as branches of a phylogenetic tree. There was indeed a traceable path: from birth, all children progressed along the same path, but at different points in their lives, various factors pushed certain groups to split off. Tinbergen’s “differences of degree” in causation argument thus led directly into his arguments about development.

6.2 Development

In “On aims,” Tinbergen characterized the ontogeny or development of behavior as the “change of behaviour machinery during development”—that is, the change of an organism’s behaviour throughout its lifetime.

In the paper, he delved into the topic of development from a very practical standpoint in that it was clear he wrote this specific paper with an audience of his peers in mind. For example, Tinbergen explained at length how to go about determining the innate and external influences on an organism’s behavior. He wrote that “in ontogeny, the conclusion that a certain change is internally controlled (is “innate”) is reached *by elimination*.” He later reiterated that other methods would be “not helpful and even wrong to apply.”⁴⁶ He proceeded to offer examples of types of conclusions that could or could not be drawn from data involving male sticklebacks, a species he worked with extensively. While the tone throughout his paper remained relatively conversational, from this section on development, it was clear that Tinbergen was very particular in establishing stringent guidelines for the application of his ideas. In stark contrast, his childhood autism work appears trivial and even juvenile, a marked deviation from the stringent guidelines he set forth a decade prior.

In *‘Autistic’ Children*, Tinbergen offered little to no analysis for the claims he was making about the ontogeny of autism. To even explore the supposed ontogeny or development of autism alluded to his belief that a child was not *born* autistic, but that they *became* autistic as a product of their environment. To support these claims, one would expect that Tinbergen might have engaged in a variation of the “elimination” analysis, which he so fervently advocated for in “On aims.” This

⁴⁶ Tinbergen, "On aims."

is not to say that he did not discuss the development of autism—in fact, he discussed it at great length—however, Tinbergen’s arguments were largely propped up by hand-waving conjecture rather than substantial observations.

Unlike other experts, Tinbergen (arguably no more than a self-proclaimed “expert”) insisted on purely environmental causes for autism. Throughout *‘Autistic’ Children*, Tinbergen refuted genetic and innate factors that may lead to autism. He wrote that “what is actually ill is something larger: the child in the web of his relationships with the social and physical outside world.”⁴⁷ From early in the publication, he implied that autism developed at no fault of children themselves, but rather through a range of social influences in their lives. Tinbergen again emphasized external, social influence when he wrote that to understand autism, “we have to realise that...socialization, which starts with and elaborates from early affiliation with the mother, leads to the formation of relationships with people from whom the child receives much of his education.”⁴⁸ The scientist made a multilayered argument here: he not only argued that at the core of socialization (and therefore autism) was the mother-child relationship, but also that there was something fundamentally wrong with how education was being conducted. Evidently, Tinbergen believed autism, as a collection of behaviors, developed because of external causes, preceding and following birth.

Throughout his elaboration on how autism develops in a child, Tinbergen was careful to address potential rebuttals. Proponents who believed autism to be, what Tinbergen termed, “an organic affliction” may have argued that babies are born exhibiting behaviors characteristic of autism. Tinbergen explained that even so, these babies “may already then be victims of non-genetic

⁴⁷ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 21.

⁴⁸ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 71.

environmental conditions—for the embryo, the womb is, of course, the environment.” He additionally argued that “a deep forceps delivery may not only cause...bodily damage...but...might...frighten the baby very badly.”⁴⁹ It is true that forceps delivery is deeply traumatic, which is why it has nearly gone extinct since Tinbergen’s time. However, Tinbergen’s mention of forceps delivery here suggested that he believed specific delivery type could set an infant on the supposed trajectory of developing autism. While it is difficult to determine the type of reception such statements would be met with, once again, one might expect that there would be accompanying evidence—and yet, there was none, not even anecdotal.

Following birth, Tinbergen discussed the possibility of “early interaction between mother and child...converted into its opposite” where, as a result, the child would “refuse contact.” He wrote that refusal of contact could also be induced when “...the mother [could be] easily disappointed by the lack of her baby’s co-operation...” Where at birth, such a relationship might be thought of as leaning unilaterally, Tinbergen clearly believed differently—he related that “the repeated mutual disappointment, the non-fulfillment in both partners of the expectations which they have of each other ...” could significantly damage the parent-child connection.⁵⁰ To us, it might feel awkward to assign this sort of will and emotion to the infant, but to Tinbergen, this may have been entirely necessary to escalate the magnitude of disruption in the parent-child connection. Only if the disruption was significantly pervasive—and therefore only through a reciprocal relationship—might a child develop autism.

Moreover, his speculation of the centrality of this relationship (which he referenced earlier in relation to socialization) largely drew from attachment theory predecessors, like Bowlby and

⁴⁹ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 124.

⁵⁰ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 127.

Harlow. For instance, the ethologist emphasized “many learning processes...normally take place during exploration,” but this exploration was only possible if a child were “sheltered by the ‘security umbrella’ that only the safe home base—primarily his mother—provides.”⁵¹ Unsurprisingly, language used to describe how autistic children diverge from non-autistic children harken back to attachment theory. The scientist also acknowledged that his views would be perceived as sexist and misogynistic, and he was willing to “[risk] the wrath of ‘women’s lib’ advocates because, whether we like it or not, it usually is, or ought to be, the mother who has the milk and feeds the baby, with all its consequent opportunities for affiliation.” To him, the father was an afterthought: “The father is important, but in a different way.”⁵²

Later, Tinbergen affirmed that “behaviour of the parents is clearly relevant to the aetiology of autism...” He rebuked rejection of “the notion that...parents of autistic children are not a random sample of the population” and claimed that “this rejection is scientifically unjustified, irresponsible, and not altogether rational.”⁵³ Ironically, in this same chapter, he also rattled off an assortment of additional “autismogenic factors”, like hospitalization, birth of a sibling, moving house, traveling, car drives, accident, divorce, and bereavement.

The contradictions between his own publications, hand-waving conjecture, and the continual lack of substantiation for his claims seem to have pushed Tinbergen into the realm of pseudoscience. At the surface-level, I think this is true: he had ventured into the pseudoscientific to support his untenable claims. Underneath, it was not as simple as Tinbergen willfully broadcasting unsupported beliefs. Through discussion of the development of autism in a child, any child, Tinbergen had something to prove. The fact remained that he was deeply entrenched in

⁵¹ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 127.

⁵² Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 130.

⁵³ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 129.

making a case for ethology in the field of autism. He hoped to illustrate the relevance of ethological methodology for autism and carve a niche for himself. Tinbergen was committed to applying the four questions in full, even when his applications compromised the inherent integrity of the science.

6.3 Function

While thinking about the function of behavior, Tinbergen followed Lorenz' lead in thinking of behaviors as organs. In "On aims," Tinbergen explained that like an organ, a behavior "was something which a species had evolved as one of its means for survival." Tinbergen viewed behavior as essential to the animal; therefore, our understanding of the animal would be incomplete without understanding the function of its behaviors—how, collectively, an animal's behavior helps it survive. He admitted that sometimes, "the survival value of many attributes, behaviour and structure alike, is so obvious as to make experimental confirmation ludicrous." The example he offered was that "[o]ne need not starve an animal to death to show that its feeding behaviour has survival value..."⁵⁴

Other times, however, the uncertainty shrouding the functions of remaining behavior patterns could explain "why ethologists are...much concerned with survival value." Despite the uncertainty, Tinbergen maintained that discovery of these functions required "exact experimentation" and was far from the "guesswork" other zoologists might pin onto this study of survival value. However, he was obliged to make allowances for the subset of ethologists who

⁵⁴ Tinbergen, "On aims."

were naturalists, himself included. For these naturalists that “[study] animals in their natural surroundings [who] must resort to other methods,” they mainly turn to “comparison” across species.⁵⁵ When he and Lies began working with autistic children, they were effectively “naturalists”: the couple observed the children in everyday circumstances, whether through interactions with their mothers or encounters with strangers. As they did not perform any experimentation, they turned to comparison of behavior observed in autistic children to behavior observed in various species of animals.

In *‘Autistic’ Children*, he frequently proceeded along a three-point trajectory to plot his comparisons. He began with a behavior observed in a specific non-human animal, translated this behavior to neurotypical individuals, and concluded by describing how this behavior was modified in individuals with autism. In this three-point trajectory, Tinbergen returned to the notion that differences in degree separated the behavior of neurotypical individuals and the behavior of autistic individuals. An example of this type of comparison arose when he discussed “redirected movements” as observed across species.

In non-human animals, Tinbergen described that “[i]n a hostile encounter...one or both of the opponents will make (often violent) attack movements, but they aim them (as we do) at anything but their opponent...” Then, in neurotypical humans, Tinbergen proposed the example of “a man who has been told off at work by his boss [as] likely to ‘take it out’ on his secretary or, at home, on his wife and children.”⁵⁶ Finally, in children with autism, Tinbergen believed that because they “interact little with others and are... too timid to explore the physical world,” would be prone to “redirect[ing] a variety of behaviours towards themselves.”⁵⁷

⁵⁵ Tinbergen, "On aims."

⁵⁶ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 44.

⁵⁷ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 45.

The unspoken purpose of using comparison to describe behavior in this way was to extrapolate function or survival value across different species. Without experimentation, there was no direct manner to definitively pin survival value to behavior. Nonetheless, by looking at a non-human species performing a behavior with a well-established function, Tinbergen had more basis to carve out a parallel in the human equivalent. As demonstrated with redirected movements, he picked a concrete, accessible example to illustrate this parallel—who among us has not taken out (or thought about taking out frustration) on an undeserving someone or something? Similarly, we often console ourselves after an encounter with a rude someone, saying they might just be having a bad day. Tinbergen did not even need to explicitly spell out the function of the human equivalent; our humanness naturally enables us to make this initial jump in his comparison. We are then primed to undertake the second jump from the neurotypical individual to the autistic child. Tinbergen framed this progression as being directly tied to the difference in degree: because individuals with autism were reluctant to interact, they would not redirect movements outward as expected.

Tinbergen was describing the phenomenon of displacement of object, which was described by Eric Berne as the “unconscious defense mechanism whereby the mind substitutes either a new aim or a new object for things felt in their original form to be dangerous or unacceptable.”⁵⁸ Displacement was a psychological concept first coined by Sigmund Freud. Tinbergen’s example of the man displacing anger onto his secretary or family was the textbook case of this phenomenon. While Freud had probably only thought of displacement in the context of humans, Tinbergen was liberal in applying this concept to non-human animals, too. Initially, we might have thought that Tinbergen began with what he observed in his beloved oystercatchers, perhaps, and henceforth

⁵⁸ Eric Berne, *A Layman's Guide to Psychiatry and Psychoanalysis* (1976).

moved to humans. Tinbergen likely reached back to the oystercatchers from humans; he then molded his analysis of function in the context of autism.

As intriguing as the implications of Freud's influence on Tinbergen might be, they are unimportant. Moreover, it is not even about whether Tinbergen was right about displacement in his progression from non-human animal to neurotypical human to autistic child. It is instead imperative to consider why he employed such a framework to set forth such an argument in the first place. Returning to function as one of the four questions, we are reminded of his commitment to align his autism work to his ethological framework.

Ultimately, Tinbergen justified behavior observed in children with autism as “a response to new conditions that overstretch a child's ability to adjust.” Such a response was indispensable so that these children could survive in “our modern, modified world.” In a callback to his discussion of the development of autism, he clarified that this behavior was not necessarily dysfunction. Instead, “the very fact of any organism means that all its life processes are functioning ‘properly’... in a manner adapted to the requirements imposed by the outside world.”⁵⁹ These novel conditions and imposed requirements were addressed in Tinbergen's last question: evolution.

6.4 Evolution

Tinbergen remained relatively committed to answering, or at least attempting to answer, each of the previous three questions. For example, just previously, Tinbergen's response to the

⁵⁹ Tinbergen and Tinbergen, *'Autistic Children': New Hope for a Cure*, 100.

question of function was straightforward: behaviors characteristic of autism are attempts to adjust to the outside world. Although his applications of ethology were at times questionable, his conclusions about autistic children based on each question mostly paralleled that of conclusions he would have drawn about non-human animals according to “On aims.” However, this did not hold as he examined childhood autism to seek out answers to his final question of evolution. This is not to say that this topic was not broached in *‘Autistic’ Children*; in fact, Tinbergen discussed evolution at great length, but from an unexpected angle.

In “On aims,” the scientist was firm in explaining that “behaviour should be studied comparatively just as structures.” Like with the preceding questions, with the study of evolution, Tinbergen advocated for cross-species comparisons (excluding humans). He listed two priorities in answering this specific question: first, “the elucidation of the course evolution must be assumed to have taken” and second, “the unravelling of its dynamics.”⁶⁰

These tasks would have necessitated something akin to creating a historical narrative for a species: how did a species come to possess its observed behaviors and physical structures? Tinbergen recognized it would have been difficult to address this question in an isolated context, which is why he advocated for cross-species analysis. He confirmed that “[this] first task [was] being pursued mainly through comparison of groups of closely related species.” Only on this scale could “conclusions about homology...be drawn” realistically. In discussing the second task, he echoed that it was being approached through “the study of survival value of species-specific characters.”⁶¹ Once again, Tinbergen established restrictions that he expected other scientists to follow—that only closely related species could be compared to draw conclusions about evolution.

⁶⁰ Tinbergen, "On aims."

⁶¹ Tinbergen, "On aims."

These guidelines were critical in a field just beginning to find its foothold in the wider discipline of biology.

Based on this analysis in “On aims,” what one might expect in *‘Autistic’ Children* would be an evolutionary analysis of autism that included cross-species comparison with species closely related to humans, such as primates. However, this comparison was totally absent. Instead, what prevailed in this book was a historical narrative about humanity overall that looked at autism as an offshoot of greater, more serious ills. Following much analysis, Tinbergen wrote in his book the following:

“We are convinced, although of course there is no ‘proof’, that the number of parents, especially mothers, who rear disturbed children because they themselves were not optimally parented is large, and that a number of autists are victims of this type of culturally caused disadaptation, one of a host of harmful ‘side-effects’ of the cultural evolution.”⁶²

What Tinbergen had been thinking and lecturing about for years—the outpacing of genetic evolution by cultural evolution—he integrated into a book ostensibly about the ethology of autism.

Tinbergen did not provide a singular definition of the cultural evolution, but rather attributed it to the collective impact of the global, sweeping changes that occurred as society modernized. In describing some changes, he was rather vague: he wrote that humanity has “created psychological forms of pollution which form a serious threat to our well-being and to that of our children.”⁶³ Other changes he referenced directly: for instance, he wrote of “the growth of all our technologies, and the giant industries to which they give birth...[that] unwittingly called up a host of...new ‘pressures’ that reduce the quality of our habitat.”⁶⁴

⁶² Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 154.

⁶³ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 153.

⁶⁴ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 152.

For all humans and non-human animals, evolution can occur because of environmental pressures contributing to natural selection. These pressures select for traits that might confer survival advantage to some members of a species, increasing their fitness. Those members then go on to reproduce and yield offspring that share those traits. According to Tinbergen, humans faced a host of manmade environmental pressures, such as the impacts of modern technologies, which for him likely included weapons of mass destruction or transportation that generated a great deal of pollution. Selective pressures of this scale would totally eclipse the smaller-scale pressures faced in textbook cases of natural selection, like the height of trees or visibility to predators. Some giraffes might have had longer necks and some moths might have had darker colored wings: these were physical characteristics that conferred an advantage and would be selected for. However, there existed no heritable human characteristics (physical or otherwise) that could immediately confer greater fitness in the face of manmade environmental pressures. As the scientist repeatedly referred to, here existed an immense lack of “adjustability” and human “disadaptation.” Genetic evolution would take generations, if ever, to catch up to cultural evolution.

For him, the issues of human “disadaptation” as a product of cultural evolution and development of childhood autism were fundamentally linked, apparent from his extensive discussion of this evolutionary perspective in *‘Autistic’ Children*. He emphasized the inseparability of these two issues when he wrote that the “weaknesses and even dangers inherent in our modern civilization [are] relevant to the problems surrounding autism.” He repeatedly underscored his position throughout the book. At one point, he wrote that he and Lies were convinced there were “a great variety of ways the modern environment affects unfavourably...the adjustability...of both mother and baby.”⁶⁵ Later, he acknowledged that science still lacked “concrete knowledge

⁶⁵ Tinbergen and Tinbergen, *‘Autistic Children’: New Hope for a Cure*, 127.

[of]...what particular respects and how exactly an abnormal environment can impair a child's development."⁶⁶ While Tinbergen may have forsaken his earlier project, "Man: Guinea Pig of Evolution," he remained entrenched in the same beliefs expressed in that draft and the same beliefs he had been expressing for the decade preceding *'Autistic' Children*.

When measured against the guidelines for analyzing evolution he had set forth in "On Aims," it seems like once again the Tinbergen of ten years prior might have sharply rebuked his later work. In fact, his methods for analyzing evolution in *'Autistic' Children* were nonexistent; despite presenting them otherwise, he admitted that the statements he and Lies made were personal beliefs rather than claims substantiated with evidence—let alone with cross-generational experimentation. In some ways, elements of evolution as one of the four questions remain present: for example, Tinbergen discussed selection pressures at length. However, overall, the analysis was jumbled, and this segment had been strongly distorted to accommodate Tinbergen's own convictions.

Ultimately, this distortion illustrated that while Tinbergen cared about understanding and "curing" autism, it was ultimately in the context of the larger "human predicament."

6.5 Watching and wondering

While there was no explicit mention of this four-question framework in *'Autistic' Children*, I have shown that Tinbergen clearly integrated his answers to the four questions into his sweeping analysis of autism. Tinbergen's adherence to his framework throughout *'Autistic' Children*

⁶⁶ Tinbergen and Tinbergen, *'Autistic Children': New Hope for a Cure*, 150.

illustrated a commitment to proving the legitimacy of ethological methods in studying autism. If he did so successfully, this would enable ethology to find a place in many other human-centered scientific disciplines. The supposed work that the Tinbergens did in their studies of childhood autism paled against Tinbergen's prior work with nonhuman animals; indeed, their work verged on pseudoscience.

However, Tinbergen arguably did not waver much in his core methods as he approached autism. From early in his career, he advocated strongly for "watching and wondering": a more hands-off approach where he observed nonhuman subjects in the field, separate from human interference. This was substantiated by his lifelong passion for photography and film. In working with autistic children, the Tinbergens also elected to observe "as unobtrusively as possible" since they believed that the children's behavior was extremely "vulnerable to 'observer interference'."⁶⁷ As we continue to grapple with Tinbergen crossing the animal-human divide, we look to other fields outside of the natural sciences. We can consider a handful of anthropologists who are also engaging in a form of "watching and wondering," as they ponder this seemingly arbitrary divide.

⁶⁷ Tinbergen and Tinbergen, *'Autistic Children': New Hope for a Cure*, 19.

7.0 In Closing

Our close examination of Tinbergen's life begs the question of why his transition to the field of childhood autism is so striking. Certainly, part of it is that he had no previous ties (professional or otherwise) to the field; however, more fundamentally, perhaps the answer is that the mere existence of the animal-human divide is such a point of contention. Nonhuman animal behavior is studied alongside nonhuman animal physiology and biology. However, human physiology and biology is studied largely separate from human behavior, which we relegate to the social sciences, including sociology, psychology, and anthropology. With this, we realize that this divide is far more pervasive and entrenched in our worldview than we perhaps initially thought.

7.1 Looking to Anthropology

As we grapple with the place of this divide in the biological sciences, it is worthwhile considering how the social sciences are approaching the same question. Certainly, anthropologists acknowledge that there exists an “urge to peek through the crack that separates humans from other species...in the social sciences, philosophy, cultural studies, and the humanities.”⁶⁸ Unlike the natural sciences, it seems that these disciplines are more interested in the relationships between humans and other species, rather than how we can apply our knowledge of other species to humans.

⁶⁸ Laura Ogden, Billy Hall, and Kimiko Tanita, "Animals, Plants, People, and Things: A Review of Multispecies Ethnography," *Environment and Society* 4, no. 1 (2013), <https://doi.org/10.3167/ares.2013.040102>, https://www.researchgate.net/publication/263417331_Animals_Plants_People_and_Things_A_Review_of_Multispecies_Ethnography.

It is true that we often treat our relationships with other species as transactional: the modernization of our world was reliant on “the labors of draft animals and cultivated plants.”⁶⁹ In a sense, the transactional nature of relationships with other species is more reminiscent of the natural sciences. Tinbergen, who gravitated towards watching and wondering, focused his studies on what there was to gain through knowledge from nonhuman animals. Later, it was this knowledge that was pivotal in his work with autistic children.

Across disciplines, the question then becomes: what can humans contribute to other species? Anthropologists have discovered there exists a multitude of examples that allow us to wonder about what is possible. The paper “Animals, Plants, People, and Things” offers one example of ongoing explorations “of the ways...mushrooms companionably figure within a global web of interdependence which encompasses rural mushroom pickers, foresters, scientists, cooks, buyers, and the complex microecologies of the mushroom’s mycorrhizal mats.” Naturally, attempting to understand this perspective can be baffling at first: it subverts the ways many of us are taught to think about the natural world. In fact, it requires us to shed these ways of thinking so we can accommodate a far more expansive—and arguably liberating—worldview.

Other anthropologists are searching for avenues that will enable us to begin transforming this worldview. For instance, some look to axolotls to teach us about “biological potentiality,” in both a literal and figurative sense.⁷⁰ Experts venerate “[the axolotl’s] biological capacity to heal and regenerate” and therefore “[interpret it] as a being that models the potential power of human biology.” The same paper argues that this work is capable of “[bringing] together nonhuman life

⁶⁹ Ogden, Hall, and Tanita, "Animals, Plants, People, and Things: A Review of Multispecies Ethnography."

⁷⁰ Emily Wanderer, "The Axolotl in Global Circuits of Knowledge Production: Producing Multispecies Potentiality," *Cultural Anthropology* 33, no. 4 (2018), <https://doi.org/10.14506/ca33.4.09>, <https://journal.culanth.org/index.php/ca/article/view/ca33.4.09>.

forms and human practices to...[consider] better living not only for people but also for Mexico's biodiverse life forms." We return to the notion that our relationships with nonhuman species can (and perhaps should) extend beyond what there stands to be "gained." Social scientists are pushing the questions: what can we receive? What can we give?

7.2 Unifying Tinbergen's Work

I think we are a few additional steps removed from asking such questions in the formal and natural sciences. Although some subfields work extensively with nonhuman animal subjects, there is a marked detachment from the subjects. Tinbergen's particular approach (as a naturalist) relied on an absence of subject interference where a relationship with nonhuman species was completely irrelevant. The first step to facilitating such a relationship, then, might look something like Tinbergen's venture into autism research: what might it mean to translate our knowledge of nonhuman animals to humans? This is not to say that Tinbergen's approach was right or wrong; that determination is not so easily made. At the very least, we should not neglect serious consideration of Tinbergen's autism work.

Some might believe that because this later research diverged so much from his earlier, far more revered animal behavior research, that it could be ignored.⁷¹ However, his autism research was, as I have shown, very much intertwined work from earlier in his career. One of the reasons Tinbergen even won the Nobel in the first place was because the committee believed his

⁷¹ Marga Vicedo, "Ethopathology and Civilization Diseases: Niko and Elisabeth Tinbergen on Autism," *Canadian Journal of Health History* (2018), <https://doi.org/10.3138/cbmh.191-122016>, https://muse.jhu.edu/article/692237/summary#info_wrap.

ethological work had implications for mankind—in what ways, the committee ostensibly left up to Tinbergen. In his case, it manifested in nearly fifteen years’ worth of autism studies in collaboration with his wife and a close circle of colleagues. While this work did not necessarily change the guidelines and frameworks of thinking Tinbergen set forth decades before he began thinking about autism, it does change it for us. When we utilize Tinbergen’s biological infrastructure, we absolutely must do so with the understanding that Tinbergen himself applied them to children with autism.

It is not so much a matter of relevance: some might argue that their own studies of nonhuman animals have nothing to do with autistic children. It is a matter of how we practice science. When we practice science, do we not look to precedents to guide how we carry out our own work? It follows that the most important precedents stem from the individual who created these scientific practices in the first place. For these reasons, it is a disservice to amputate Tinbergen’s later work simply because it may not conveniently fit into how we wish to practice science.

At the conclusion of his 1963 paper “On aims,” Tinbergen concluded with the following: “What does seem to me to matter is the growing awareness of the fundamental unity of the Biology of Behaviour, and the realization that “Ethology” is more than “Physiology of Behaviour”, just as “Biology” is more than “Physiology.” In classrooms teaching biology, we take much of the tools and techniques at face value, or, rather, out of context. The tools and techniques themselves are frequently amputated from the scientists who developed them. Of course, introducing nuance takes time and does not come so easily. It may be easier to just not introduce it at all. But putting these tools and techniques to use in isolation makes for creating science that is also in isolation—in a dynamic world, it is crucial to steer away from science that is stagnant and inward-looking. We

may not approach the issues we care about like Tinbergen did, nor may we defend our choices in the same fashion as he. Yet, through following Tinbergen from the Hague to Oxford and from birds to human children, we are assured of the dynamic possibilities for growth and change that can accompany looking forward and outward.

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