

Duplicating Nature and Elements of Subjectivity in *The Ethology of the Greylag Goose*

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Abstract: This contribution emphasizes the production context and cycles, as well as the epistemic role and functions, of the research film *The Ethology of the Greylag Goose* (*Die Ethologie der Graugans*), by the ethologist Konrad Lorenz, and focuses on the changing epistemic practices of animal observation in research films, intertwining Lorenz's academic career and public role, as well as the reception of his film. *The Ethology of the Greylag Goose* can be understood as fundamental in establishing ethology as a new and innovative discipline and in promoting Lorenz's public image and his specific ethological approach, as well as shifting the idea of a unique subject–object relation toward a redistribution of roles and epistemic practices in various reuse settings.

ANIMAL OBSERVATION IN RESEARCH FILMS

This contribution explores the epistemic practice of animal observation in the ethological research film *The Ethology of the Greylag Goose* (1935–1937), by the zoologist Konrad Lorenz (1903–1989). To understand the essential interactions of observed animals and human observers in Lorenz's film, it is necessary to take the production context and reuse of the film into account. The main aim is to contextualize the animal–human relations in ethological research films in order to understand the changing epistemic practices and shifts of perspective in animal observation through the film lens in the twentieth century.¹ A case study of *The Ethology of the Greylag Goose*, an early science film production, helps to clarify the transformation of subject–object relations and to demonstrate how Lorenz contributed to the debate on the epistemic function of images in experimental settings by introducing himself as a subject into his films. Moreover, as Tania

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¹ Lorraine Daston, "The Empire of Observation," in *Histories of Scientific Observation*, ed. Daston and Elisabeth Lunbeck (Chicago: Univ. Chicago Press, 2011), pp. 81–113; and Daston and Peter Galison, *Objectivity* (New York: Zone, 2010), pp. 119–121. For a cultural history of animal bodies see the introduction by Maren Möhring, "Andere Tiere—Zur Historizität nicht/menschlicher Körper," *Body Politics: Zeitschrift für Körpergeschichte*, 2015, 2:249–257.



Figure 1. Konrad Lorenz and his colony of geese. Film still taken from *The Ethology of the Greylag Goose* (*Die Ethologie der Graugans*), by Konrad Lorenz, produced in 1937 and released in 1950 as C 560 by IWF Göttingen, <https://doi.org/10.3203/IWF/C-560>. Provided by the German National Library of Science and Technology (TIB).

Munz has pointed out, he used geese as “typological” and “individualized” animals to stress his ethological findings.²

Correspondingly, the film illustrates the ongoing struggle of science in the pursuit of “objectivity” and what Hans-Jörg Rheinberger has described as various interchanging epistemic practices over time.³ The move toward more sterile and controlled laboratory-based experimental settings in the twentieth century was supported by behaviorists, who emphasized the functionality of environmental factors as crucial for animal behavior. In contrast, ethology integrated approaches from brain research, psychology, and behavioral theory and looked to instincts. The latter focus became known as classical or vitalist ethology, which Lorenz shaped into a very specific epistemic approach. Its essential idea was to create a wholesome and appealing “biology of behavior” that focused on interactions with animals and also promoted a romantic ideal of naturalist field studies.⁴

The Ethology of the Greylag Goose was shot between 1935 and 1937 at Lorenz’s research institute in Altenberg, Austria, though it would be another thirteen years before its release by

² Tania Munz, *Der Tanz der Bienen: Karl von Frisch und die Entdeckung der Bienensprache* (Vienna: Czernin, 2018); Munz, “Of Birds and Bees: Karl von Frisch, Konrad Lorenz, and the Science of Animals, 1908–1973” (Princeton, N.J.: ProQuest Dissertations and Theses, 2007); Munz, “Die Ethologie des wissenschaftlichen Cineasten: Karl von Frisch, Konrad Lorenz und das Verhalten der Tiere im Film,” *montage/av*, 2005, 14(1):52–68; and Munz, “My Goose Child Martina’: The Multiple Uses of Geese in the Writings of Konrad Lorenz,” *Historical Studies in the Natural Sciences*, 2011, 41:405–446, <https://doi.org/10.1525/hns.2011.41.4.405>.

³ Hans-Jörg Rheinberger, “Etwas über Kulturen des Experimentierens,” in *Experimentieren: Einblicke in Praktiken und Versuchsaufbauten zwischen Wissenschaft und Gestaltung*, ed. Séverine Marguin et al. (Bielefeld: Transcript, 2019), pp. 25–35; and Lorraine Daston, “Objectivity and the Escape from Perspective,” *Social Studies of Science*, 1992, 22:597–618, <https://doi.org/10.1177/030631292022004002>.

⁴ Hanna-Maria Zippelius, *Die vermessene Theorie: Eine kritische Auseinandersetzung mit der Instinkttheorie von Konrad Lorenz und verhaltenskundlicher Forschungspraxis* (Braunschweig: Vieweg, 1992), p. 27; and Irenäus Eibl-Eibesfeldt, “Human Ethology,” in *New Aspects of Human Ethology*, ed. Alain Schmitt et al. (Boston: Springer, 1997), pp. 1–23.

the Institute for Scientific Film (Institut für den Wissenschaftlichen Film [IWF]).⁵ *The Ethology of the Greylag Goose*, a 11:30-minute research feature, was not only Lorenz's first film as a director but also a document of his enduring scientific endeavors to establish ethology as a new methodology and a specific way of engaging in a controlled animal observation experiment. The abstract describes the research film as follows:

The film gives a survey on innate behaviour patterns of the grey-lag goose *Anser anser* L. The first part shows reproductive behavior ("triumph calls," mating preliminaries, mating, nest building, covering and retrieving eggs, defending). In the second part some behaviour patterns of goslings being imprinted on their human foster parent are shown: following reaction, separation of two flocks according to their imprinting, response to the alarm call and landing "by order" of the flying young.⁶

The main reason Lorenz selected greylag geese for the experiments is that they were sociable and easily trained and that the imprinting of behavior patterns was relatively easy to achieve. Lorenz's idea was to study habits and reactions in order to "observe a domesticated animal in its natural environment in complete freedom, but also in a completely tamed manner."⁷

Lorenz collaborated with the Reich Institute for Film and Images in Science and the Classroom (Reichsanstalt für Film und Bild in Wissenschaft und Unterricht [RWU]) on *The Ethology of the Greylag Goose*, and postproduction was set to be completed in 1943. It seems remarkable that a nonmilitary research film remained scheduled for completion during the war. Other RWU productions in the works that year consisted largely of content related to warfare—such as the treatment of gunshot wounds and field surgery—as well as films commissioned for the Wehrmacht and the Reich aviation ministry.⁸ The willingness of the RWU to finish the project in wartime demonstrated Lorenz's extraordinary scientific standing and the support he received from Nazi officials.

In the end, the release of *The Ethology of the Greylag Goose* had to be postponed until 1950, hindered by the war and subsequent postwar disputes. The RWU was dismantled, but its scientific film collection found a new institutional base in the IWF, which took over most of the former RWU science and university film collection. Subsequently, *The Ethology of the Greylag Goose* was catalogued as number C 560, with a sale price of DM 53 and a rental copy fee of DM 7.⁹

Lorenz's main goal was to compile a full inventory of learned and spontaneous animal movements, which he called "ethograms." His aims corresponded well with the perceived need for

⁵ Günter Hummel, "Das Institut für den Wissenschaftlichen Film: Möglichkeiten—Aufgaben—Ergebnisse," *Informationen der Universität Göttingen*, May 1976; and Gotthard Wolf, "Die Aufgaben des Instituts für Wissenschaftlichen Film," *Mitteilungen des Instituts für den Wissenschaftlichen Film*, 1956, pp. 1–3.

⁶ See the English translation and the original German abstract at <https://doi.org/10.3203/IWF/C-560>.

⁷ See the supplement: Konrad Lorenz: *Ethologie der Graugans—Begleitveröffentlichung des Institut für Wissenschaftlichen Film zu C 560/1950* (Göttingen, 1976), p. 3. (Here and throughout this essay, translations into English are mine unless otherwise indicated.)

⁸ Working reports of the RWU, University Film Department, 1943, Folder R 169/8, Bundesarchiv, Berlin. For more on the RWU see Wolfgang Tolle, *Reichsanstalt für Film und Bild in Wissenschaft und Unterricht* (Berlin: Hoenemann, 1961); Malte Ewert, *Die Reichsanstalt für Film und Bild in Wissenschaft und Unterricht (1934–1945)* (Hamburg: Kovač, 1998); and Michael Kühn, *Unterrichtsfilm im Nationalsozialismus: Die Arbeit der Reichsstelle für den Unterrichtsfilm/Reichsanstalt für Film und Bild in Wissenschaft und Unterricht* (Memmingen: Septem Artes, 1998).

⁹ Institut für Film und Bild in der Wissenschaft und Unterricht, Abteilung Hochschule und Forschung, *Verzeichnis der wissenschaftlichen Filme* (Göttingen, 1951).

audiovisual recordings as part of scientific data generation and the idea that film could be an epistemic instrument, contributing to both the experimental setting and the desired experimental results.¹⁰

ELEMENTS OF SUBJECTIVITY IN *THE ETHOLOGY OF THE GREYLAG GOOSE*

In *The Ethology of the Greylag Goose*, Lorenz presented himself several times in front of the camera, not only knowingly performing as a subject but also interfering in the experimental setting. The natural habitat of the geese was a less controllable setting than the laboratory, but repetitive movements still created the desired behavior patterns. Lorenz not only played with the functions of the camera and with the relation of observer and observed animals by modifying expected observational virtues such as the roles of spectator/expert and protagonist/animal in his films; he also challenged what were perceived to be the virtues of the film in scientific contexts. Scientific cinematography was supposed to “create visual evidence through its technicality.”¹¹ Lorenz playfully swimming with or walking and leading his goslings about was the opposite of “objective” or “authentic” observation. Several scenes capture Lorenz’s direct smile or glance at the camera. He seems to be communicating with his assistant, Alfred Seitz, behind the camera and confirming that a successful recording has been achieved—one singular moment among many failed attempts, it would seem (see Figures 2a and 2b).

In the film, most of the hard work required to imprint successfully and evoke certain desired reactions in the goslings became a visible element of the experimental setting. By repetitive training, he clearly gathered new insights into behavior patterns, but Lorenz was also present as an experimental subject himself; his film lacked the typical detachment of an observer.

For example, in one of the first scenes Lorenz staged a fight by repeatedly hitting and confronting a male goose. The scene was cut into the film twice, from different angles, and provided insight into the subject–object relationship. The subsequent scenes exemplify how the redistribution of human and animal roles was conducted. Geese are shown in their mostly unadulterated habitat, but Lorenz was always an integral part of their daily adventures.

C 560 is a silent film, with no plot-oriented storyline or voice-overs, but several inserted titles do indicate that mating and triumph calls are being shown. In one sequence, Lorenz prompts the geese to follow him into the garden on a stony path. He guides them down the trail into the sunny yard and sits briefly on a bench; they then take off running, again with him as the leader of the pack. C 560 concentrated on what Lorenz anticipated would be the most important imprinted behavior patterns, rather than on a “coming of age” story as the goslings aged and grew; such a narration would emerge later in Lorenz’s bestselling books, such as *King Solomon’s Ring*, from 1949.

Interestingly, human on-screen appearances and subject interference were entirely absent from the later zoological films Lorenz provided for the film archive project Encyclopaedia Cinematographica (EC), which relied on recordings of single movements in short sequences and unaltered “film documents presenting a phenomenon as it actually happens.”¹² Several early zoological research films became a central part of the ambitious EC project, which was conceived by the head of the IWF, Gotthard Wolf, and which Lorenz supported from the outset. Lorenz’s

¹⁰ Konrad Lorenz, *Hier bin ich—wo bist du?* (Munich: Piper, 1988), pp. 106–109 (ethograms); and Jeanine Reutemann, “Into the Forest: Über die gegenseitige epistemische Unterwanderung von Wissenschaft und Film,” in *Kunst, Wissenschaft, Natur: Zur Ästhetik und Epistemologie der künstlerisch-wissenschaftlichen Naturbeobachtung*, ed. Marcus Maeder (Bielefeld: Transcript, 2017), pp. 113–167.

¹¹ Reutemann, “Into the Forest,” p. 137.

¹² Virgilio Tosi, *Cinematography and Scientific Research* (Paris: UNESCO, 1977), p. 25.



Figure 2. (a) Examples of subject/object redistribution. (b) Performance, staging, and interference. Film stills taken from *The Ethology of the Greylag Goose*. Provided by the German National Library of Science and Technology (TIB).

former assistant Wolfgang Wickler later recalled the EC as a “cinematographic museum” that was constructed like the “musculoskeletal system,” consisting of single “building blocks of motion picture sequences.”¹³ The EC focused on short clips of isolated movements intended for educational purposes and for studying animal behavior, excluding all interaction between observer, observed animal, and camera.¹⁴ Several of the ideas behind the EC project were already noticeable in *The Ethology of the Greylag Goose*. The refined version of the ethograms, however, appeared in later research films that Lorenz co-produced with the IWF in the Max Planck Institute for Behavioral Physiology, founded in 1958. Lorenz managed the research facility in the secluded village of Seewiesen as vice-director and popularized the rural science colony as a research film hub.¹⁵ This specific experimental field study approach was refined in Seewiesen in the 1960s and 1970s and featured scientists living closely with the experimental animals in a rural setting.¹⁶ Lorenz basically kept the popular holistic portrayal alive, and the ideal of the ethologist nurturing and caring for his animals served as a blueprint for later bestselling books and films.

The other end of the epistemic spectrum of animal observation was a controlled experimental setting, usually indoors, with fixed vertical power structures. Such experiments were common in behaviorist research, and human interference was conspicuously absent. This approach was

¹³ Wolfgang Wickler, *Wissenschaft auf Safari: Verhaltensforschung als Beruf und Hobby* (Berlin: Springer, 2017), pp. 60–61.

¹⁴ Gotthard Wolf, *Der wissenschaftliche Dokumentationsfilm und die Encyclopaedia Cinematographica* (Heidelberg: Springer, 1967); and W. Krüger, “Encyclopaedia Cinematographica: Die Bedeutung des Films für die Erforschung des Fortbewegungsvorgangs bei den Tieren,” *Research Film*, 1956, 2:201–205.

¹⁵ Thomas S. Kuhn would call that process the normalization of science; see Thomas S. Kuhn, *The Structure of Scientific Revolutions: Fiftieth Anniversary Edition* (Chicago: Univ. Chicago Press, 2012), p. 36.

¹⁶ Lorenz, *Hier bin ich—wo bist du?* (cit. n. 10), p. 106.

adopted as the basis of many German research films from the early twentieth century. One of the most popular representations of epistemology by means of objective virtue was the “Skinner box” and its mechanical functionality.¹⁷

Lorenz’s early film differed from the dominant behaviorist epistemic practices and their use of animals as experimental objects.¹⁸ For example, B. F. Skinner related to his observed animals in a clear and stable power hierarchy where the observer was in control. Skinner’s wartime “Project Pigeon” sought to train birds to control a panel for an automatic weapons system.¹⁹ It became apparent that the idea of capturing geese in their natural habitat differed greatly from “using” or objectifying experimental animals as tools in settings like the Skinner box.

In contrast, *The Ethology of the Greylag Goose* included several elements of subjectivity, which was a long-debated issue in the natural sciences. Of course, the technical preparations for Lorenz’s research films involved a lot of planning and depended heavily on the manipulation and staging of animals, but for the camera Lorenz presented an unaltered naturalist ideal.²⁰ He even named and attributed human features to “filmable” young goslings like Martina, whose “biography” he developed.²¹ Consequently, the understanding that one should follow a strict protocol with a repetitive display remained, but Lorenz’s use of and interplay with the camera presented an image of nature with a conscious observer. Lorenz also mobilized his scientific status to assert that this picturesque setting indeed counted as scientific; finally, despite—or, more precisely, thanks to—the evident subjectivity of his observational setting, he achieved academic success and public recognition. His support of the racist agenda of the National Socialist dictatorship and his infuriating statements after 1945—such as his lack of compassion for people with AIDS and his expression of a certain “sympathy” for the disease, given overpopulation and the ongoing destruction of the planet—nonwithstanding, his scientific reputation only grew.²² Moreover, as Lorenz’s behavioral concepts of imprinting and domestication were gradually accepted by the German and international scientific community, C 560 offered validation for his basic arguments.

Crucially, Lorenz not only drew on findings from zoology and biology in his work but presented animal studies and his vision of modern ethology as crossover disciplines with ties to psychology and sociology—all of which could ultimately lead to a better understanding of human behavior traits such as aggression.²³ Moreover, Lorenz appeared on-screen not only as a role-playing, caring parental figure, who talked, canoed, fought, played, and even swam with his domesticated geese, but also as an animal expert. Vinciane Despret summarized the various relations on display as a

¹⁷ Daston and Galison, *Objectivity* (cit. n. 1), pp. 119–190; and Benjamin Schultz-Figueroa, “From Cage to Classroom: Animal Testing and Behaviorist Educational Film,” *Film History*, 2018, 30(4):127–154.

¹⁸ I thank Oliver Gaycken for pointing me to that comparison.

¹⁹ Benjamin Schultz-Figueroa, “Project Pigeon: Rendering the War Animal through Optical Technology,” *Journal of Cinema and Media Studies*, 2019, 58(4):92–111.

²⁰ For example, this manipulation and staging involved the selection and training of several geese suitable for specific scenes. See Munz, “Die Ethologie des wissenschaftlichen Cineasten” (cit. n. 2), pp. 58–65.

²¹ Munz, “Die Ethologie des wissenschaftlichen Cineasten,” pp. 59–60; and Munz, “My Goose Child Martina” (cit. n. 2), p. 412.

²² On Lorenz’s role during National Socialism see Katja Thimm, “Wissenschaft + Technik: Ruf nach dem Rassepfleger,” *Spiegel Online*, 8 Oct. 2001, <https://www.spiegel.de/spiegel/print/d-20289358.html> (accessed 9 Sept. 2020). Regarding his other objectionable statements see Theodora J. Kalikow, “Konrad Lorenz’s ‘Brown Past’: A Reply to Alec Nisbett,” *Journal of the History of the Behavioral Sciences*, 1978, 14(2):173–180; and Doris Kaufmann, “Konrad Lorenz: Scientific Persona, ‘Hamack-Pläncker’ und Wissenschaftsstar in der Zeit des Kalten Krieges bis in die frühen 1970er Jahre,” preprint, *Ergebnisse des Forschungsprogramms Geschichte der Max-Planck-Gesellschaft* (Berlin, 2018), p. 8, http://gmpg.mpiwg-berlin.mpg.de/media/cms_page_media/221/GMPG-Preprint_06_2018.pdf (accessed 9 Sept. 2020).

²³ Richard W. Burkhardt, Jr., “The Founders of Ethology and the Problem of Human Aggression: A Study in Ethology’s Ecologies,” in *The Animal/Human Boundary*, ed. Angela N. H. Creager and William Chester Jordan (New York, N.Y.: Rochester Univ. Press, 2002), pp. 265–295, esp. p. 294.

renegotiation of the role for observation. Hence, the field study approach Lorenz promoted could be seen as a perfect example of a new anthropomorphism—and also as an epistemic shift in the experimental setting and epistemic practice of animal observation that combined animal psychology and behavior studies in new ways.²⁴ Moreover, Lorenz shaped the spectator's view of how ethology gathered new knowledge about animal behavior by using film recordings as experimental instruments and promoting research films as integral parts of his scientific vision.

FILM DISTRIBUTION AND RECYCLING: “MOTHER”/“FATHER” OF THE GEESE

In terms of distribution and reception, *The Ethology of the Greylag Goose* was a success story—not only for Lorenz, but especially for the IWF, which sold the copies of C 560. The IWF also rented out twenty copies over the years to different institutions to keep the film in circulation and later copied the 16-mm material onto two DVDs, a procedure that was undertaken only for the most sought-after scientific films in its vast collection. Since the 1950s, numerous educational organizations have purchased or borrowed the film. To the present day, C 560 remains one of the most frequently downloaded IWF productions. The film was sold as an educational film package that included a supplement authored by Lorenz himself, who underlined the importance of visualization and recording behavior patterns for “objective” research into animal behavior.²⁵

In addition, Lorenz's subsequent research film on ducks, *Courtship and Mating of the Mallard* (*Balz und Paarbildung bei der Stockente* [C 626]), released in 1952, intensified his public image as a science star and a charismatic persona. Lorenz secured great media popularity, especially through the recurring depictions of his close companionship with his bird populations. Lorenz as “Gänsevater” was only one of them.²⁶ Overall, the mostly positive press coverage of Lorenz overshadowed much of the later critique in the scientific community and the critical public view of his connection to National Socialist science programs and his questionable ideas on the “degeneration” of domesticated animals.²⁷

Not long after Lorenz was awarded the Nobel Prize in 1973 “for discoveries concerning organization and elicitation of individual and social behavior patterns,” both the international press and various educational programs reinforced his public image as “father of the geese.” Lorenz was portrayed in several documentaries that discussed imprinting and showed his unique research approach in Seewiesen. For example, the National Geographic Society used material from C 560 (mostly the swimming and canoeing scenes) in their educational feature *Konrad Lorenz—Science of Animal Behavior*, starring Leslie Nielsen, in 1975. Here Lorenz introduces Nielsen to the latest experiments conducted in the vast garden around the Max Planck Institute. Nielsen concluded in his voice-over that the experiments in Seewiesen “duplicated nature as closely as possible.” Then

²⁴ “The setting is articulating new ways of talking, new ways of being human with non-human, human with goose, goose with human”: Vinciane Despret, “The Body We Care For: Figures of Anthro-po-zoo-genesis,” *Body and Society*, 2004, 10(10):111–134, <https://doi.org/10.1177/1357034X04042938>, on p. 129 (see pp. 127–131 on renegotiation of the rules for observation). See also Kaufmann, “Konrad Lorenz” (cit. n. 22), p. 35.

²⁵ Lorenz, *Ethologie der Graugans* (cit. n. 7), p. 2. Information on rental copies and download numbers in the TIB Hannover AV-Portal were cordially provided by former IWF employee Paul Feindt in email correspondence, 17 Jan. 2020, 29 Jan. 2020.

²⁶ See the Max Planck Society portrait of Konrad Lorenz titled “Der Gänsevater,” https://www.mpg.de/4310517/Konrad_Lorenz (accessed 9 Sept. 2020). Regarding his burgeoning public image see Kaufmann, “Konrad Lorenz” (cit. n. 22).

²⁷ For a critically revised take on Lorenz's involvement in the National Socialist science system see Burkhardt, “Founders of Ethology and the Problem of Human Aggression” (cit. n. 23), pp. 294–295; Klaus Taschwer and Benedikt Föger, *Konrad Lorenz: Eine Biographie* (Munich: Deutscher Taschenbuch, 2009); and Föger and Taschwer, *Die andere Seite des Spiegels: Konrad Lorenz und der Nationalsozialismus* (Vienna: Czernin, 2001).

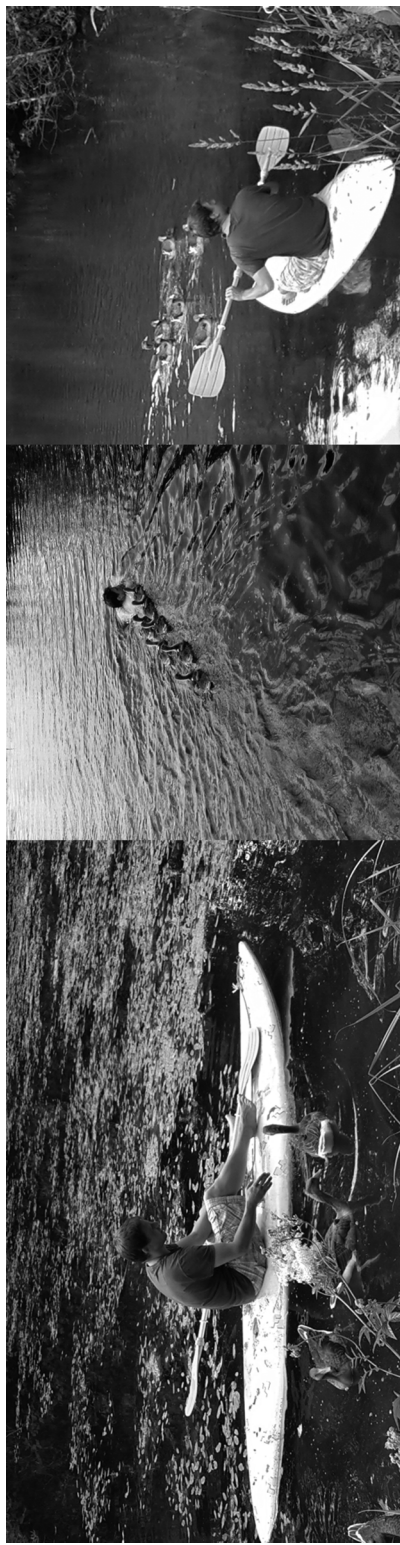


Figure 3. Examples of imitation: Michael Quetting and his colony of geese. Photo copyrights are courtesy of Michael Quetting, who is a researcher and a technical assistant at the Max Planck Institute of Animal Behavior in Radolfzell.

the audience meets a younger research assistant in front of the camera and learns how she trained the animals and ultimately took over the role of “mother of the geese.”²⁸ Another important element was a solid and well-equipped research infrastructure, which exemplified the Max Planck Society’s philosophy of extensive funding of long-term fundamental research and was well suited to compiling the desired ethograms and film recordings.²⁹

The image of Lorenz as “father of the geese” has echoed in recent popular zoological literature. For example, Michael Quetting’s take on the ethology of geese in his book *Papa Goose: One Year, Seven Goslings, and the Flight of My Life (Plötzlich Gänsevater)* imitates and updates Lorenz’s film eighty years later (see Figure 3) and even adds a scene where he flies with them in his modified aircraft.³⁰

CONCLUSION

Within the large canon of ethological and zoological research films, *The Ethology of the Greylag Goose* stood out in several ways. First, it marked Lorenz’s epistemic shift from a sensory-oriented physiology toward seeking an understanding of animal psychology and behavior. The film also represents the institutionalizing and normalizing of ethology as a legitimate scientific discipline at the turning point to neuroscience. Second, the film promoted Lorenz and his specific experimental design, which draws on subjectivity rather than objectifying the animals as experimental utensils. By recycling the film material in several educational features, Lorenz popularized ethograms and created a distinct style of well-known zoological research films. Third, *The Ethology of the Greylag Goose* is evidence of the successful return and evolution of the subject in experimental settings and filmic observational practices, which were legitimized as justification of an innovative behavioral science.

²⁸ For the Nobel Prize citation see <https://www.nobelprize.org/prizes/medicine/1973/lorenz/facts/> (accessed 9 Sept. 2020); for the National Geographic program see <https://www.youtube.com/watch?v=lysBMqaSAC8> (accessed 9 Sept. 2020).

²⁹ Wickler, *Wissenschaft auf Safari* (cit. n. 13), pp. 81–82.

³⁰ Michael Quetting, *Plötzlich Gänsevater: Sieben Graugänse und die Entdeckung einer faszinierenden Welt* (Munich: Ludwig, 2017).