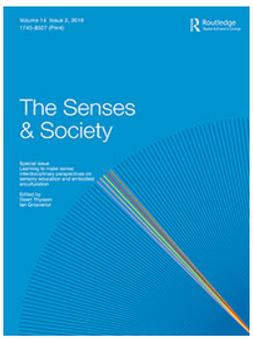

The Senses and Society

ISSN: 1745-8927 (Print) 1745-8935 (Online) Journal homepage: https://www.tandfonline.com/loi/rfss20

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To cite this article: Silvy Chakkalakal (2019) The child of the senses. Education and the concept of experience in the eighteenth century, The Senses and Society, 14:2, 148-172, DOI: 10.1080/17458927.2019.1626643

To link to this article: https://doi.org/10.1080/17458927.2019.1626643

Published online: 01 Jul 2019.

THE SENSES AND SOCIETY
2019, VOL. 14, NO. 2, 148–172
https://doi.org/10.1080/17458927.2019.1626643

Routledge
Taylor & Francis Group

The child of the senses. Education and the concept of experience in the eighteenth century

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ABSTRACT

Taking the German picture-encyclopedia *Picture Book for Children* (1790–1830) of Friedrich J. Bertuch as a vantage point, this article presents a thick historiographical description of the concept of experience and the role of visual material in relation to the figure of the child. I am interested here in the formation of the notion of experience and specifically in the ways experience has played a key role in the debates over the concepts of vitalism, epigenesis, and experience-based (verbal) imagery in the Enlightenment. The broad call for clearness, vividness and the employment of images in the literature of the period highlights crucial negotiations of sense-based practices in education and scholarly knowledge production. Experience, sensation, perception, and observation became catch-words within anthropological and philosophical reflections on how to showcase life itself. Through a careful analysis of early biological images and image practices in Bertuch's *Picture Book*, I show the picture was supposed to initiate interaction. Pictures become a crucial part of communication processes and practices of bourgeois self-assurance, also with regards to racialized, sexualized and gendered subject formation.

KEYWORDS

Experience; history of education; anthropology of the senses; imagination; sensibility; gender; history of perception

The anthropologization of the senses

The widespread calls for "clarity" and "vividness" in the scholarly works of the eighteenth-century highlight a major change in practices of knowledge production. Sensation, perception, observation, and experience became catchwords within anthropological and philosophical reflections on society, history and nature in general. This article traces how the emergence of the empiricist concept of experience – a key concept within the social sciences to this day – was closely tied to education and the figure of the child.

Friedrich Justin Bertuch's *Picture Book for Children* (1790–1830) serves as an excellent example of the contemporary debates on intuitive cognition and "vividness" in the German context. In light of what Sergio Moravia (1977) has called the anthropological turn in the eighteenth century, the *Picture Book* showed the latest natural scientific, ethnological and anthropological views of the time. In competition with other scientific publications, Bertuch's publishing house delivered the *Picture Book* in the form of a magazine consisting of five copper plates, which comprised 237 booklets. The

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complete edition contains 1,186 plates, which were divided into 17 classificatory categories, echoing other encyclopedic and natural-historical works of the time. The *Picture Book* was not only widely disseminated throughout Germany, but also translated and sold in Britain, France, and Italy. After 1796, the publishing house additionally started to produce a commentary which accompanied the *Picture Book* booklets. Without exaggeration, one can say that Bertuch's enterprise was one of the largest pictorial projects of its time and was much discussed (Chakkalakal 2014). Today, we look at some 12 volumes with 100 copper plates each and a commentary of 24 volumes (Bertuch 1790–1830; Funke 1796–1833).

Interestingly, Bertuch positioned all his visual media in relation to the wider debate about whether images help or hinder the production of knowledge.[1] Opinion was deeply divided on the issue of the education of the child. Should pictures be employed in the training of the senses or do they, contrarily, interfere with the educational process? The question of whether the picture possesses the capacity of creating and transmitting knowledge has to be understood as a crucial part of changing epistemological, scholarly and educational practices in the last third of the eighteenth century. Following this, I would like to trace the epistemological entanglement of education and the concept of experience back to their grounding in the discursive formation of the "anthropologization of the senses" in the Enlightenment. Tellingly, both pictures (of knowledge) and "making experience" were thought to imprint sensory-physical impressions on the child's mind or brain.

Already, at this point, it needs to be stressed that "child" does not refer to an asexual, ahistorical and universal category, even though as a figure it constantly produces and reenacts an universalized human condition. Rather, the figure of the "child" crystalizes as a cultural narrative molded in figurational processes (gendered and racialized) within specific epistemological debates, in literary and popular fields. Consequently, the figure of the child correlates closely with other subjectivities, such as "the woman," "simple people," "the savage," or "the idiot" (not to be mistaken as real persons but rather subject forms). These different subjectivities connect with and, moreover, help configure the male, bourgeois, European and sane subject equipped with full control over his senses and, by this, on the path to "proper" cognition.

In the pages that follow, I first lay out the concept of experience within the broader context of contemporary anthropological debates concerning the body's relation to the soul (section 2). In the next section, I analyze how the figure of the child becomes a key agent within the anthropologization of the senses. Again, I follow the conceptual ramifications of "experience" and show how the child and "making experience" become entwined (section 3). We only get an understanding of Bertuch's visual and sensory way of vitalizing nature itself by analyzing the bigger epistemological debates on vividness and clearness of knowledge production in contrast to "too dry" and "too abstract" systematics in section 4. Here, I look at the entangled debates of vitalism, epigenesis, and experience-based (verbal) imagery, before moving on to an image analysis of exemplary illustrations from Bertuch's *Picture Book* that showcase life and vitalization (section 5). Though I want to avoid nationalizing the epistemological debates on the senses in the German-speaking context of the period, my analytical foci are the specific German local conditions and disciplinary processes of educational sciences, and the role the concept of experience plays here. Therefore, I am interested in analyzing German historical sources which have been translated for this article for the first time, while adducing comparable and highly influential developments in France at the same time.

Sensualization of mankind: "experience" as a key concept

Anthropology, or "the natural history of man," became one of the key scholarly enterprises of the eighteenth century (Schings 1994; Vermeulen 2015). During this time, anthropological works are linked very much to medical sciences and interest in the bodily constitution, with a focus on the lower orders of cognitive functions, such as imagination, perception, and memory (Zelle 2001). Physicians, natural scientists, and physiologists had taken up anthropological studies about the human body and soul in a context which, in the first half of the century, had not yet become disciplinary. This changed quickly within decades when, in the last third of the eighteenth century, the idea of the *homo duplex* – the Cartesian concept of man separated in body and mind/soul – was increasingly contested (Kersting 1992, 79, 117ff.; Wokler 1993, 122ff). In this context, Michael Wagner, a physician in Vienna and member of the Mineralogical Society of Jena, presented his *Contributions for the Philosophical Anthropology and Its Related Sciences* (1794–1796) as one of many anthropological works of this time:

> In view of the sources from which anthropology takes its perceptions, we can speak of an *anthropology of the external* senses and one of the internal senses. The former would be the system of those experiences of man which we obtain by the *affect from outside*; the latter involves those observations which we owe to the affect *from inside* and by the empirical self-consciousness. – Because of his external sense, man appears to us as a living, organic body, in which everything has sense and purpose; because of the internal sense, the capacity of imagination, emotion and desire make man a versatile being with certain virtues and faculties. (Wagner 1794–1796, XII–XIII [transl. S.C.], original emphasis)

We can see that Wagner does not fully abandon the idea that humans consist of two components. He writes, in fact, about "a double personality," yet he presents a sensory-organic version of this concept. His notion of "the external senses" refers to the impact of the physical stimuli of the surrounding world on the human body, while by "the internal senses," the author means the capacity to process those stimuli (Wagner 1794–1796, XIII–XIV). This revaluation of sensory perception started with the repositioning of the human body, which, at that point, moved into the focus of anthropological attention. Here, the senses played the role of an interface between body and soul/mind, with the latter being naturalized as part of the body. The so-called higher faculties were made dependent on sensory perception, so that the soul/mind was no longer perceived as a metaphysical phenomenon but rather as a physiological one. This is one of the reasons the term "soul" often gets replaced by "brain" in the anthropological literature around 1800 (Hagner 2008, 58–62).

Clearly, Wagner's concept of anthropology and its validation of the senses were influenced by the German-speaking reception of John Locke (1690). It was Locke's empiricism that influenced the change from the idea of a mechanistic "homme machine" towards the idea of the feeling "homme sensible." Locke understood sensations as stimuli from the outside world: once the stimuli touched the mind, they would translate themselves into ideas. According to Locke, the physical effect on the senses ("sensations") leads to perception and cognition ("reflections"). It is on the basis of this sense-based interplay that ideas and moral principles are built (and become "experience") (Locke 1690). In other words, Locke conceptualized experience as something that was made by collecting sensory impressions and simultaneously processing them.

Consequently, he criticized Descartes' model of perception, which suggested that ideas were inherited and came from God (Descartes [1641] 1976). The very fact that the process of cognition was no longer understood as God-given but was radically relocated within the human body/mind transformed humanity into a research object itself.

The understanding of "experience" outlined above became essential for early anthropology in the eighteenth century. A whole field of medical-psychological research conceptualized experience as a physiological process in the brain (Figlio 1975; Zelle 2001). The German mathematician and philosopher Johann Heinrich Lambert, similar to many prime anthropologists of the time, such as John Locke, Étienne Bonnot Condillac, Claude Adrien Helvétius, Charles Bonnet, Jean-Baptiste-René Robinet, and Johann Caspar Lavater, assumed that psychology and physiology were fundamentally connected.[2] In his influential work *Novum Organum or Thoughts About the Examination and Description of the True* (1764), Lambert understands experience as a physiologico-anatomical movement or as he puts it: a "sensation which is propagated by the movement of nerves and fibers into the brain" (Lambert 1764, 279 [transl. S.C.]). Experience is seen here as a persistent impression in the literal sense of the word, as a bodily imprint which manifests in the brain. According to Lambert, only this physiological process of imprinting could lead to further processes of mental abstraction and, eventually, to knowledge.[3] Karl Figlio brings epistemologies of the senses and the brain into a relationship in his examination of Scottish anatomist Charles Bells' *Idea of a New Anatomy of the Brain* (1811):

> The nervous system was the mediator between mind and body, between the psychological and the physiological. Although fluid and poorly defined in the physiology of the time, this interface was the object of intense concern. Since sensation was a fundamental unit of the sensualist psychology then dominant, a theory of neurological function included almost by definition a theory of sensation. (Figlio 1975, 178)

In the frame of these body/mind debates, the soul/mind could be perceived as an organic phenomenon that was naturalized. Thoughts on sensible nerves, muscles in motion and brain activity led to questions about sensibility, sense-based experience, and cognition and can be found in anthropological tractates of the time.

Experience was not only understood as a perceptive faculty but, moreover, apprehended as a method of gaining knowledge. On the whole, this inductive methodological understanding brought the individual experience of the subject in relation to general scientific knowledge. This dual understanding of experience connected body and mind closely: experience was understood simultaneously as a bodily imprint and a process of cognition. It could be transformed into an anthropological universal by referring to it as a bodily state of mind and equally understanding it as an applicable scientific method. Around 1800, we can see that the idea of experience became a firm part of German bourgeois everyday life. One finds numerous expressions in contemporary magazines, books, and treatises which show the widespread acceptance of the term, such as "from experience," "how we learn from experience," "the undeniable experience" or "verified via experience."

The child as *l'homme sensible*

Experience was also understood as the consolidation of sensory perceptions. This early anthropology of the senses was, thus, unthinkable without experience.

Anthropologists defined "the making of experience" as an imperative of human thinking and the production of knowledge in general: "With no experience, no reason!" The human subject has to have experiences – the more the better. Karl Friedrich Pockels, one of the early protagonists of German "*Erfahrungsseelenkunde*" (best translated as the "beginnings of empirical psychology"), sees experience as the basic human impulse and incitement in his anthropological work *The Man. An Anthropological Character-Portrait of His Sex. A Counterpart to the Characteristic of the Female Sex* (1805–1806):

> The man – willingly or unwillingly – has to make experiences, which he, following his destiny, cannot avoid – he has to be tossed about, before he achieves a calm standpoint; his education, his nature, his destiny goes through a thousand called and uncalled hands to give him his form and his direction. He resembles a factory good which needs a thousand fingers for its polish and perfection. (Pockels 1805–1808, Vol. 2, 341 [transl. S.C.])

At this point, yet another important aspect of the modern concept of experience becomes apparent: experience is linked to the personal and social development of the individual. Development does not simply address a subjective sphere in the form of individual making of experience; instead, it also speaks of the social habituation which becomes apparent in the notion of the "thousand fingers [of teachers, parents, relatives, nannies, etc.] for its polish and perfection" (Pockels 1805–1808, Vol. 2, 341 [transl. S.C.]).[4] Following this, "making experience" has to be understood as a cultural practice that was part of the social order in which every person had to acquire a certain position. The creation of the male, white, bourgeois subject makes this very apparent (Mayer 2006). Experience as a concept was gendered, racialized and socially classified. The title of Pockels' book already shows that male experience constitutes the privileged center. "Women," "savages," "children" and "simple people" were all considered the "Other" of the white male subject. We find individual cognitive theories (Bloch 2005; Cohen 2005) and educational programs for all of these subjectivities. We might even go so far as to say that concepts of experience and education needed the so-called Others with their own specific educational programs in order to ensure the constant contrast that helped to create the notion of normalized personal and human progress.

By way of example, the education of the female child Sophie in Rousseau's *Emile* (1762), located in the last chapter, "Book Five," ends with Sophie getting married to Emile – the ultimate goal of the female education. In the four previous chapters, we follow Emile and his male educator through the former's educational development, which implements a quintessentially sensory training:

> The child's first mental experiences are purely affective, he is only aware of pleasure and pain; he needs a long time to acquire the definite sensations which show him things outside himself, but before these things present and withdraw themselves, so to speak, from his sight, taking size and shape for him, the recurrence of emotional experiences is beginning to subject the child to the rule of habit. (Rousseau 1762, Vol. 1, 91 [transl. S.C.])

There is no corresponding "search for abstract and speculative truths, for principles and axioms in science" and, thereby, a sensory training for female children (Rousseau 1762, Vol. 4, 112 [transl. S.C.]). Critical cognition is a male practice and entails a gendered education: "To train the senses it is not enough merely to use them; we must learn to

judge by their means, to learn to feel, so to speak; for we cannot touch, see, or hear, except as we have been taught" (Rousseau 1762, Vol. 1, 332 [transl. S.C.]).

In sum, we find here a strong correlation between gender and the production of anthropological knowledge regarding sexualized body politics, gendered concepts of the human mind, and specific educational programs for women and girls and children in general, as well as colonialized and disabled Others (Knott and Taylor 2005; Mayer 2006; Poeter 1995). At this point in history, education as a means of social formation and integration into social roles and positioning became essential; the German expression "Ausbildung" (literally translated as a process of forming and shaping; "ausbilden" = to form from) makes this even clearer.

Education, with its ideas of *perfectibilité*, viability, educability and development, first and foremost, centered around the figure of the child, which works as a generic agent in relation to the universal figure of man. Children were instructed to collect as many impressions as possible with the assistance of experience conceptualized as both an anthropological condition and method. In doing so, contemporaries believed that the child was gradually shaped by experiential imprints which helped the child to come to an understanding and generate knowledge. Empiricist and sensualist theories of cognition used the figure of the child as an example of the human acquisition of knowledge.[5] The reception of Rousseau was highly inspirational in the German philanthropic-pedagogical context.[6] During the last third of the eighteenth century, the emergence of the discipline of educational science correlated strongly with the anthropologization of the senses analyzed above.

Alongside the disciplinary fields of "*Erfahrungsseelenkunde*," physiognomy and medicine, early educational science advanced to one of the most important fields of anthropological practice. Early pedagogues had come up with theoretical questions about perception, sensibility, and cognition by building upon their practical observations. Children became literally part of their experimental designs. Accordingly, experience ascended to a key concept, and it was projected onto the early stages of human biography:

> A precise study of the human soul teaches us that all changes of our imaginings and its earliest beginnings lie solely in experience, and we place the beginning of our nature's mental activity in the aura of our existence by the time the earliest imaginings sink into us via bodily impression. The earliest imagination of the soul is, in other words, the starting point of its life, its practice. (Moritz and Pockels 1787, 78–79 [transl. S.C.])

With the temporal focus on "the earliest," "the beginnings" and "the starting point," the figure of the child becomes essential; in the fashion of a laboratory setting, scholars could follow the child's gradual acquisition of knowledge (see Illustration 1). The idea of man solely driven by experience (*Erfahrungswesen*) became naturalized via the figure of the child; the child served as an example par excellence for the "*homme sensible*." The philanthropic school reformer Johann Stuve explains the child's anthropological particularity paradigmatically:

> The child constantly and intuitively wants to see, aspires for distinctive sensory perception. Simple descriptions and verbal exposition are relatively little or not at all attractive; he/she will get tired and fall asleep: But if you leave him/her [the child] to see, hear, feel the object

Illustration 1. "Tab. XII: Anfang des menschlichen Verstandes." In: Basedow, Johann B. 1774. *Elementarwerk*. Berlin: Crusius. © Research Library for the History of Education (BBF), Berlin.

> for himelf/herself, there he/she lives and vibrates, there his/her whole strength of mind works, there he/she leaps for pleasure and joy. (Stuve 1788, 217–218 [transl. S.C.])

The child represented the concept of empiricist comprehension in general and, by this token, he/she was seen as the earliest prerequisite for the later grown-up faculty of reason.

Johann Basedow shows this empiricist-cognitive understanding of the child in his famous picture book *Elementary Work* (1774), which was one of the many educative tools of the time for the training of the senses. We see different children testing their senses on the copper plate with the significant title "Beginning of human reason": on the upper left figure, pulling a friend and feeling the force, tasting a pretzel, smelling fire. The lower left figure shows children experimenting and observing (e.g. gravity by tossing a ball) and, thus, gaining experience and building knowledge. While the children in these images enact the "making of experience," the adults represent the careful usage of the senses and their acquired knowledge. Similarly, the plate puts forward a sensory hierarchy which privileges the senses of hearing and seeing, represented by the grown-ups (e.g. top left, one adult tapping at his ear and hearing the bell, and the other one watching the sky, observing the weather). The idea of the gradual acquisition of knowledge is further epitomized in the top right image of the old man contemplating the

different stages of his life. At the same time, this image exemplifies the key aspects of the revaluation of sensory perception which I have addressed previously: by understanding the soul as the human capacity to imagine and perceive in a sense-based and avid, impulsive and instinctive way, it was conceptualized as a bodily-physiological phenomenon. The formerly so-called "lower" capacities of imagination and memory were now revaluated and seen to form the base of the social and epistemological figuration which Sergio Moravia has described best with the term of "homme sensible" (Moravia 1978).

The call for vividness and (verbal) imagery

Bertuch's publishing house, "Industrie-Comptoir," produced many visual media with which Bertuch answered the contemporary call for vivid clarity. He founded his enterprise in order to develop a visualized natural history. Bertuch addressed his ideas on vividness and popularization to a wider audience in his 38-page treatise *About the Means to Make Natural History Accessible for the Public Benefit and to Introduce It to the Practical Life* (1799). These thoughts are, first and foremost, put into practice in his *Picture Book*, which competed with other academic works at the time in the publication of the latest technical and architectural inventions, discoveries of natural history and early ethnographic views. In contrast to other scholarly works which did not use pictures at all or used them as mere auxiliary tools, the images in the *Picture Book* served as the center of information: The book contains a full-page copper plate on each of the left-hand pages and a short verbal commentary on each of the right-hand pages.

"Not too scholarly," "sensory," "vivid" and "lively" were the watchwords with which Bertuch promoted the products of his publishing house. His call for vividness in natural history should be placed within the fundamental changes of ideas about nature, humanity, and history in the last third of the eighteenth century. The influential studies of Lovejoy (1953), Foucault (1966), Lepenies (1978), Moravia (1978), Koselleck (1979) and Reill (1986) all document essential shifts in the production and presentation of knowledge, coinciding with the emergence of vitalistic and organological views in addition to mechanistic concepts of nature and the human race (see also, with a wider historical framing, Herman, Priem, and Thyssen 2017; Petrina 2014). Vitalism brought forth the idea of epigenesis, which proclaimed that life develops gradually out of an undifferentiated matter, in contrast to preformationism, which followed the theory that living matter develops out of a preformed nucleus (Roe 1981). Vitalists understood nature as the developmental force that lies within an organism.[7] Relational epistemological shifts involved a changeover from spatial taxonomies to temporal orders, and the increasing replacement of chronological and static views by lively, process-orientated interpretations. These changes brought forward the disciplinary formation of anthropology, biology, and history, all of which examined the human subject and nature generally in the light of these transformed categories and ideas (Wellmann 2017). In this context, older traditional concepts of cognition were not simply obsolete; instead, contemporaries discussed these heavily (Maienschein 2005; Reill 2005; Schmidt 2004), as I will show further in the image analysis that follows. It is important here to attend to the specific use of experience and of inductive empiricist methods in order to grasp fully the discussion

of the time on vividness, development, and liveliness. It becomes more evident that contemporary disputes on the employment of pictures played an essential role in this transition (Chakkalakal 2011; Wellmann 2008).

Bertuch's *Picture Book* opens up an exemplary view upon the debates around vividness which manifests in the binary opposite of "hidden, interior, often hard to find." Here, vividness is a plea for revealing the hidden attributes and illustrating the inner workings of a natural object:

> The *characteristic* introduced of the *hidden*, interior and often hard to find *visual attributes* of a natural object (Habitus), whose exterior appearance does not obviously match, is too scholarly and too difficult. The most prominent contradictions are produced between the [interior] attributes and the exterior appearance. (Bertuch 1799, 8 [transl. S.C.], original emphasis)

The assessment of classifications as "too scholarly and too difficult" draws on the French sensualist criticism of the classificatory systems of knowledge, which was derived from Étienne Bonnot Condillac's *Traité des Sistêmes* (1749). Here, five years before in his *Traité des Sensations* (1754), Condillac had criticized traditional object classifications for being more concerned with the principles of the classificatory system than with the object of nature itself. According to him, the deductive way of producing knowledge by starting from general assumptions would lead to unnatural abstractions (Cassirer 2007). By contrast, he propagated the idea of knowledge which was generated by observation and experiment. Condillac's sensualist definition of "system" was transferred into the *Encyclopédie* (1751–1772) by Diderot and d'Alembert and thereby popularized (Condillac 1749, 1–2; Diderot and d'Alembert 1751, vi). Condillac's distinction between "*esprit de système*" and "*esprit systématique*" served tellingly in the *Encyclopédie's* introduction to justify its systematic call to be a collection of general knowledge.[8] In contrast to "*esprit de système*", "*esprit systématique*" was supposed to be able to preserve the sensory impression without destroying it with abstract principles. Consequently, the naturalness of the object was thought to remain untainted (Cassirer 2007, XI, 7–8; Riskin 2002, 12, 108).

The critique of overly abstract classifications played an important role, especially in the field of natural history. French naturalist Georges-Louis Leclerc Buffon went along with the opinion that natural-historical classification lacked sensibility and directness. The "Initial Discourse" of his famous *Histoire naturelle, générale et particulière* (1749–1789) bears the programmatic headline "On the manner of studying and writing about natural history" (Buffon [1749] 2008, Vol. 1, 3).[9] The work starts with the proposal for the proper method to study natural history, which Buffon bases on the notion of vividness in order to preserve the naturalness of the object of study. Here, the sense of sight is key to grasping and understanding nature in its multiple forms: "Thus, a beginning should be made by observing things often and by frequently reexamining them" (Buffon 1749, 6 [transl. Lyon 1976, 146]). Buffon introduces "looking at" as the right method to practice natural history:

> The essential thing is to fill the heads of such beginners with ideas and facts, and thus prevent them, if possible, from prematurely establishing schemata. […] In order to avoid such shortsightedness, I have said that it is necessary to begin the study of nature by very broad observation. (Buffon 1749, 6 [transl. Lyon 1976, 146])

Contrary to the obstacle of shortsightedness, seeing, observing, and visual comparison are repeatedly introduced as the first methods to gain knowledge about nature's different designs and forms: "[A] world of infinite combinations, some harmonious and some opposed; a world of perpetual destruction and renewal. What an impression of power this spectacle offers us! What sentiments of respect this view of the universe inspires in us for its Author!" (Buffon 1749, 11 [transl. Lyon 1976, 149]). The comparative observation of natural objects should keep novices and children from judging them with a preexisting classificatory system in mind. Buffon believed that preconceived classifications were unnecessary abstractions within the mind that prevented one from a true understanding. Instead, the object of investigation should be approached with the vivid directness of the senses.

In the context of the *Histoire Naturelle*, Buffon hoped to gain this kind of lively vividness by changing the language of natural history, which was generally perceived to be the opposite of vivid, i.e. dry and dead:

> And in order to avoid falling into monotonous repetitions the form of descriptions ought to be varied and the thread of history changed as it appears necessary. And, likewise, for the sake of making descriptions less dry, it is wise to blend into them facts, comparisons, and reflections upon the uses of various organs – in a word, to write so that you can be read without boredom as well as without contention. (Buffon 1749, 31 [transl. Lyon 1976, 160–161])

The German translator inserts the word "*belebt*" ("vivified," "vitalized") into this passage[10]: The entangled use of facts, comparisons and reflections and the comparative dynamics which accompanied this use were interpreted as a linguistic transfer or transposition of nature's vitality and dynamic forces into words. "Vivid liveliness" was put forth against "dry" and "boring." Consequently, Buffon presented a language which was meant to capture life itself by employing the visual-sensuous methods of seeing, comparing and describing (Lepenies 1978, 131–168; Spary 2000). "Examining looks" and "simple looking at" form the first steps in accessing nature without the interposition of any preexisting model of classification. This visual and descriptive language tried to capture the first experience of nature (and here, the German word "*erleben*" captures this best with its literal meaning: "to live the sensation"). The call for observing, comparing and describing every little detail was accompanied by the need to demonstrate: life itself was showcased.

At this point, it becomes eminently apparent that this changed method of examining natural history operated in a sense-based way: the changed vivid order was supposed to be a vitalized and animated order. While the traditional Linnaean system employed as few characteristics as possible to describe an object, Buffon, by contrast, wanted to incorporate almost all the characteristics into the descriptive account (Müller-Wille 2002; Nickelsen 2000, 54–56). Therefore, the comparative examination became essential for this empirical and vitalistic way of studying natural history. The introduction of the epistemological principles of vividness and liveliness integrated the use of the scientific illustration in a changed manner. The image – heavily employed, for example, within the *Histoire Naturelle* and the *Encyclopédie* – was thought to represent life itself, and it was another tool to breathe life into a natural-historic language (Barthes 1964; Graczyk 2004). The connection between the vividness of style in writing about nature and the

vitalization of matter is anything but random. At its core lies achanged understanding of nature that is now vitalistically perceived in dynamic motions of becoming, developing and emerging.

The motif of vitalization and the focus on life itself can be found in various social contexts of the time and cannot be reduced to the academic sphere of natural history. Mary Shelley's *Frankenstein* (1818) is the most popular literary example of the contemporary search for life. The novel tells the life story of Victor Frankenstein, a Swiss-born scientist trained in chemistry and natural philosophy, who experimentally searches for the secret of life: "One of the phenomena which had peculiarly attracted my attention was the structure of the human frame, and, indeed, any animal endued with life. Whence, I often asked myself, did the principle of life proceed?" (Shelley [1818] 1823, 81–82). In the manner of contemporary scholars, Frankenstein is interested in aspects of the life force itself. He approaches life by turning to death as its antipode and develops a godlike method to infuse a dead body with life. After he has formed a human-like body from human remains, he repeatedly summons the secret of vitalization: "After days and nights of incredible labour [sic] and fatigue, I succeeded in discovering the cause of generation and life; nay, more, I became myself capable of bestowing animation upon lifeless matter" (Shelley [1818] 1823, 84–85).

Shelley's example from the fields of literature and popular culture shows that vitalization was a broadly discussed topic of the time. The interest in grasping processes of life sensorially and the call for demonstrations of life exceeded the mere academic sphere. Vividness involved two dimensions at the same time: firstly, the will to comprehend life processes and, secondly, the need to display and express these. Language itself needed to be vitalized and was thought to initiate the sensory impression. The genre of Gothic fiction should be read against the background of such sense-based anthropological and natural-historic theories, and Shelley's eerie-animated monster fits the sense-based profile (Minter 2001). Seeing and demonstrating became vitalistic methods and led to further methodological questions, such as how life can be showcased under the aspect of transformation and change as well as its principles of sensation, movement, and physiology. As it became common sense that knowledge was formed by experiential imprints, scholars thought about finding a way of representation that made "experience making" possible in the first place.

Animated pictures: Bertuch's project of the sensualization of nature

Bertuch participated actively in the debates on empirical intuition and experience. His aim was to present natural objects in a vivid, lively and simple manner. His critical opinion towards complicated classifications fitted perfectly within the theories of vivid intuition among the German philanthropic educational scholars, who, as became obvious, followed the French sensualist system critique. In the context of the wider debate on classificatory systems and the production of knowledge, children, laymen and so-called "simple people" served as the prime audience. Moreover, they functioned as a model for the need for simple, vivid, useful and practicable knowledge transfer. This double structure of being a "model for" and "model of" education may explain the great success that scientific images had as an educative tool for children (te Heesen 2002). These cultural figures and the sense-based concepts of childhood itself stand in close

correlation with the "Others" of education: women, colonial subjects and the mentally disabled, all of them often portrayed as being childlike.

As I have shown, the *Picture Book* represents Bertuch's commercial interest in utilizing the epistemological connection between vividness and the figure of the child. Bertuch introduced children, their educators, and parents as consumers of special educational tools such as visual material. The image as an educative tool had a high plausibility around 1800: The concept of children's gradual acquisition of knowledge served as a legitimation for the project of a visualized natural history. Having this in mind, Bertuch's remarks about the classificatory order of the *Picture Book* are illuminating:

> It is quite necessary that the [copper] plates are presented to the eye and seemingly follow each other, as world's nature normally does, without a system and order and with the highest variation and diversity. A child who gets tired over monotonous objects, who changes within minutes into amusement, who is very lively, always wants to see something new and different, cannot bear a systematic sequence of many plates with repetitive or quite similar objects, e.g. nothing but fishes, birds, insects, national costumes, etc., without getting tired and losing his/her amusement. For this reason, I have made the most flamboyant and colorful mix of things and if one wants to criticize me for that, I just ask to consider that I am dealing with children whom I would just like to entertain. (Bertuch [1790] 1801a, 5 [transl. S.C.])[11]

Bertuch connects the lively natural world to the lively imagination of the child, which in exemplary fashion presents an imaginary of childhood itself. The form of representation is structured according to the child's perception of the world and precisely not the adult's: "The eye of the lively child sees completely different than the eye of the adult, which is able to restrain itself and to abstract" (Bertuch [1790] 1801a, 2). For Bertuch, the image was a generator of experience. It was thought to leave imprints in the child's mind, which would lead to knowledge under careful adult advice. The image in the *Picture Book* was not just understood to make knowledge vivid but to go further by producing cognition itself. The reduction of text, furthermore, shows that the image started to occupy the central role. It was no longer understood as a mere auxiliary tool but gained a more important function than the written word.

One can see in Illustration 2 "Natural History of the Smooth Newt" how the arrangement of the image proceeded epistemologically. Stages of development were made visible: Growth, change in form, and structural formation. This picture shows that its focus of knowledge is not only on the living natural object but especially on the process of becoming and life itself. Hence, Bertuch presents the evolution of the smooth newt, a copper plate that combines three originally separated pictures taken from the Italian physiologist Mauro Rusconi's book *Amours des salamandres aquatiques et development du tetard de ces salamandres depuis l'oeuf jusqu'a l'animal parfait* (1821) (Illustrations 3–5). When comparing Rusconi's illustrations and the *Picture Book's* plate, one can see that Bertuch's engraver copied the illustrations in a detailed manner but transferred them onto one single plate. Consequently, a new order of development was being designed which made it possible to grasp development at one glance. Here, the *Picture Book* orders and sequences the particular stages of development: conception and spawning in the center (Illustration 2, fig. 1-3); maturing of the eggs on the outer left and right side (Illustration 2, fig. 4-7); stadium between egg and embryo and development of the embryo to polliwog (tadpole) (Illustration 2, fig. 8-12). The copper plate

Illustration 2. Naturgeschichte des Wassersalamanders, in: Bertuch, Friedrich J. (ed.), *Bilderbuch für Kinder*. Weimar: Industrie-Comptoir, 1821, Vol. 10 – Plate 67. © Research Library for the History of Education (BBF), Berlin.

grasps life by enacting the dynamics of development. This sequential way of arranging and combining individual drawings creates development as a pictorial tableau (Reill 2005, 159–182). The eye follows the different stages of development, and the gaze is forced to switch back and forth between the different illustrations; in doing so, the vigorousness and vitality of developmental processes themselves can be felt in a sensory-physical way.

Illustration 3. M. Rusconi: Salamandre aquatiques, Pl. I. (1821), in: M. Rusconi: *Amours des salamandres aquatiques et development du tetard de ces salamandres depuis l'oeuf jusqu'a l'animal parfait*. Milan: Giusti, 1821. © University Library Tübingen (Call number: 257.4).

Illustration 4. M. Rusconi: Salamandre aquatiques, Pl. II. (1821), in: M. Rusconi: *Amours des salamandres aquatiques et development du tetard de ces salamandres depuis l'oeuf jusqu'a l'animal parfait*. Milan: Giusti, 1821. © University Library Tübingen (Call number: Bh 257.4).

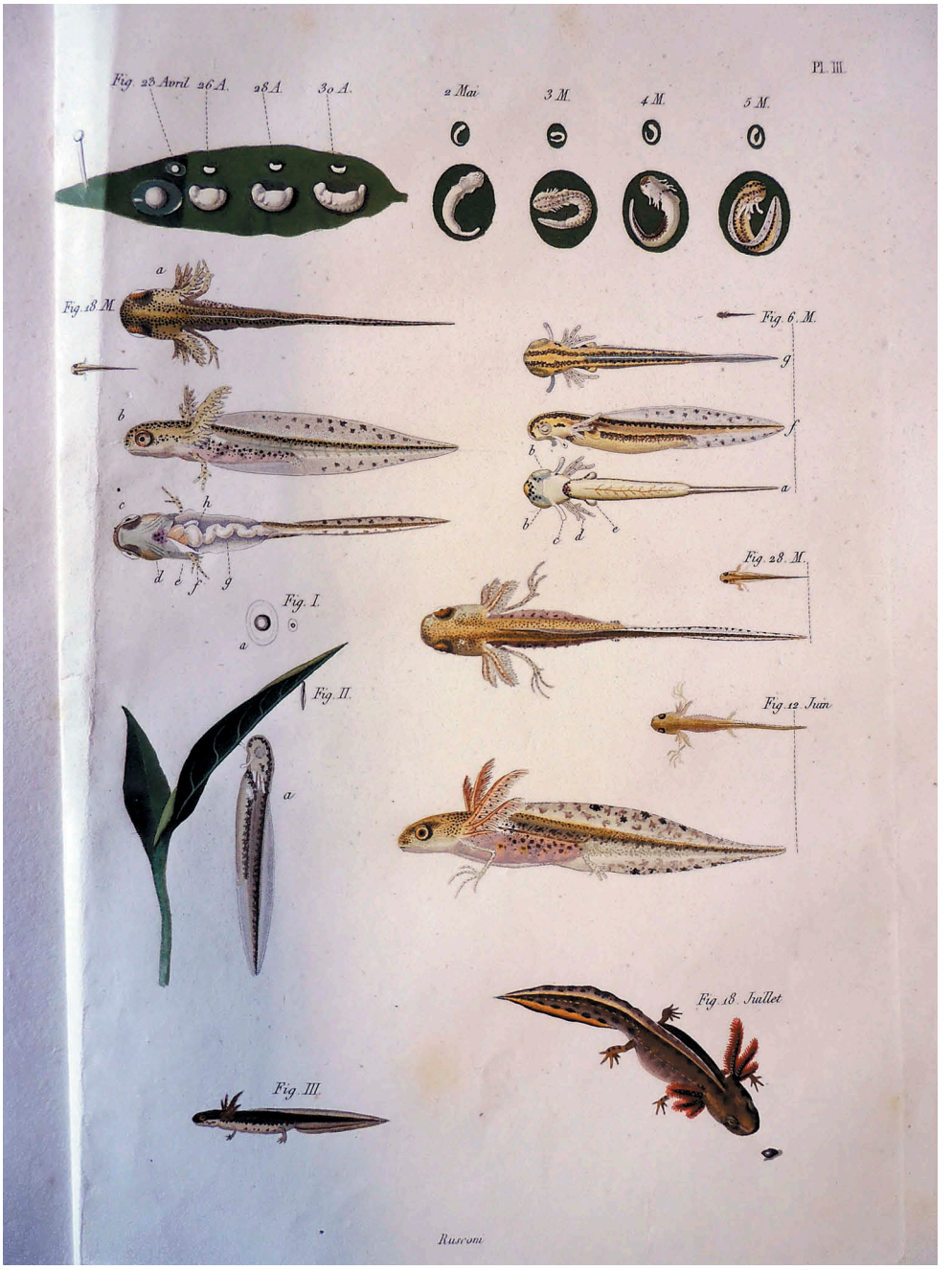

Illustration 5. M. Rusconi: Salamandre aquatiques, Pl. III. (1821), in: M. Rusconi: *Amours des salamandres aquatiques et development du tetard de ces salamandres depuis l'oeuf jusqu'a l'animal parfait*. Milan: Giusti, 1821. © University Library Tübingen (Call number: Bh 257.4).

The *Picture Book* entered into the discussions of vitalism, epigenesis, and preformation, as we can further observe in Illustration 6 and 7. Illustration 6 "Development of

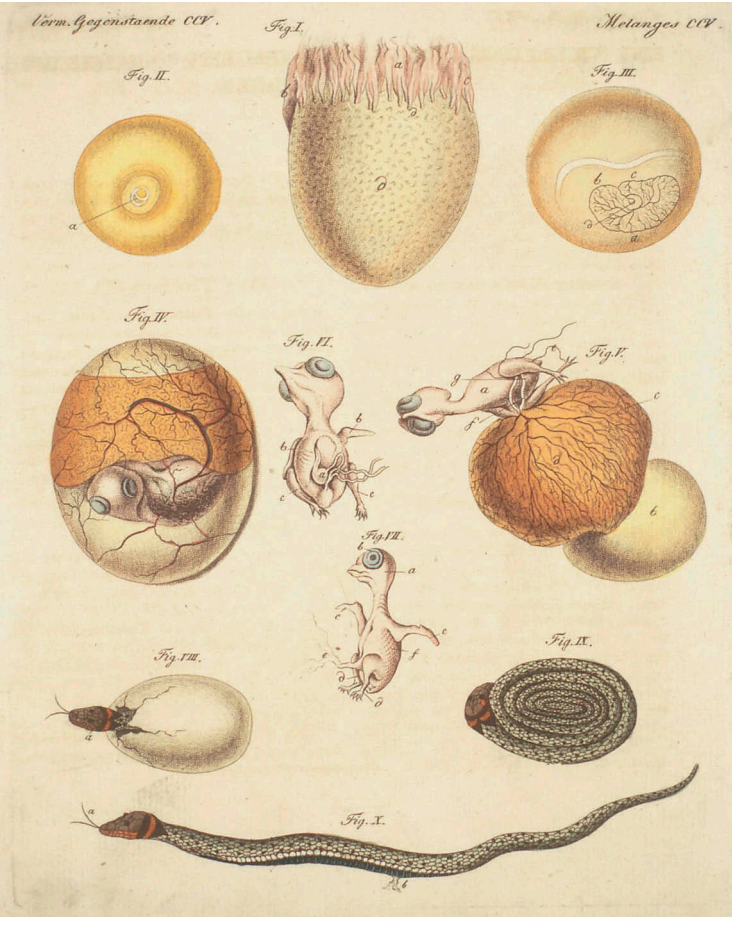

Illustration 6. Entwickelung [sic] der Hühner, Tauben und Schlangen aus den Eiern. In Bertuch, Friedrich J. (ed.), *Bilderbuch für Kinder*. Weimar: Industrie-Comptoir, 1821, Vol. 8 – Plate 72. © Research Library for the History of Education (BBF), Berlin.

Chicken, Pigeons, and Snakes from Eggs" illustrates not simply gradual growth, as we can see contrastingly in S. T. von Soemmering's tableaux of a human embryo (Illustration 8, von Soemmering 1799), which follows the theory of preformation. In contrast to von Soemmering, therefore, Bertuch shows structural formation (Illustration 6, fig. I.-VII.) focuses on the moment both of the birth of a ring snake (*Natrix natrix*) (Illustration 6, fig. VIII.) and of giving birth (Illustration 6, fig. IX.).

Illustration 7 "The Development and Reproduction of Plants, and the Sleep of Leaves" shows the topics of germination and blossoming in motion. Consequently, we see four different initiation processes of germination: Illustration 7, fig. 1-4 show us different insights into a cherry sprout; firstly, by observing the cherry and its exterior shape (Illustration 7, fig. 1) then, by bisecting it to illustrate its inner life (Illustration 7, fig. 2) and, conclusively, by following the same visual pattern with the seed itself (Illustration 7), fig. 4 and 3). Illustration 7, fig. 5 shows the moment of the beginning of the blossoming of a chestnut flower and Illustration 7, fig. 6 the ovary of a pumpkin seed, whose germination has already begun.

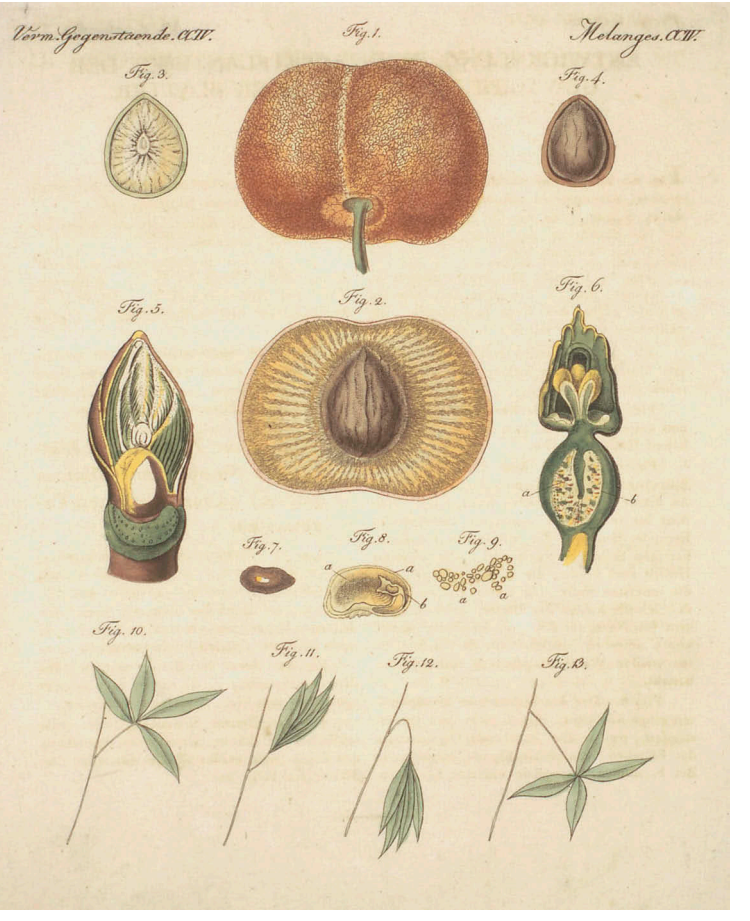

Illustration 7. Entwickelung [sic] und Fortpflanzung der Gewächse, und Schlaf der Blätter. In Bertuch, Friedrich J. (ed.), *Bilderbuch für Kinder*. Weimar: Industrie-Comptoir, 1821, Vol. 8 – Plate 71. © Research Library for the History of Education (BBF), Berlin.

Illustration 7, fig. 7–9 demonstrate the sprouting of a bean, starting from the outside and going on to reveal the inner processes and attributes. The pictorial order of development is arranged into four simultaneous processes of germination of cherry, chestnut, pumpkin, and bean, which do not follow a chronological pattern but, rather, cut through moments of development simultaneously. The bottom part of Illustration 7, fig. 10-13 shows a process of the rising, setting and, finally, dying of a shy plant (*Mimosa pudica*), emphasizing the dynamics and movements of development. The illustrator creates a distinct understanding of developmental temporality using this comparative and analogous arrangement of different plants. Visual synchronicity can produce a sense-based simultaneity of development. The images in Illustration 7, for example, do not follow a clear epigenetic or preformist pattern. The image of the seed does not offer any conclusion whether the later form of the plant was thought to be already there or whether the form was developed out of undefined matter. While the *Commentary* of the *Picture Book* follows a clear preformist theory,[12] the image can perform a theoretical openness. From a history of science standpoint, a harsh separation between

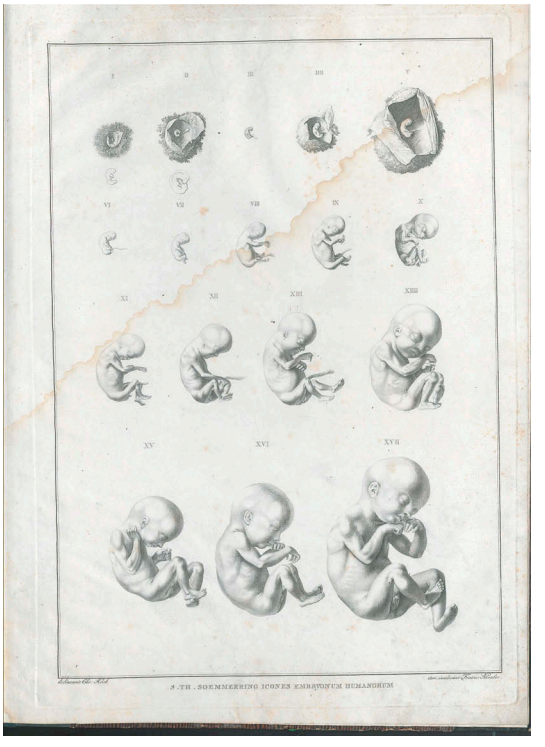

Illustration 8. Icones Embryonum Humanorum. In S. T. von Soemmering: Icones Embryonum Humanorum. Frankfurt: Varrentrapp and Wenner, 1799. © Staatsbibliothek Berlin.

preformist and epigenetic theories of the eighteenth century is not sustainable, as they appear to be much more heterogeneous and complex. These ambivalences in developmental theory have been pointed at by key protagonists in the debate, for example, the debate between Albrecht von Haller and Caspar Friedrich Wolff (Detlefsen 2006; Roe 1981; Witt 2008, 651–652). The image analysis, however, offers another insight into these epistemic intertwinements.[13] Illustration 7 is not only a common example of the fact that different developmental argumentations were entangled but the plate, moreover, shows how illustrations could open up a space of imagination which served, simultaneously, as a space of theoretical negotiation.

Illustration 2, 6, and 7 are, thus, prominent examples of the concept of the experiential image and its effort to capture life itself to make cognition possible by being vivid and lively. These images tried to be lively and animated in a double sense; on the one hand, they were thought to trigger physiological processes of impressions to activate imagination and memory; on the other hand, they showed processes of life, such as birth. As I have mentioned before, the topic of animation was discussed widely in different social fields – literary, natural-historical, anthropological – and not only the educational technologies, such as the picture but also educational practices, such as collecting, observing, describing and comparing, all tried to vitalize and illustrate knowledge production itself.

Conclusion: some thoughts on the correlation of child, experience, and picture

The preceding analysis has shown, through an examination of Bertuch's *Picture Book* and its wider anthropological context that pictures for children were intended to illustrate the becoming of life and changed concepts contributed to the vitalization of knowledge production. The intertwined phenomenon of the vividness of style in demonstrating and representing nature and of the vitalization of matter itself lies embedded in a network of representational practices and ideas. The picture-tableau of knowledge in Bertuch's *Picture Book* serves as an important example of the combined practices of "proper cognition," "making experience" and "forming knowledge-impressions." My goal has been to show that the anthropological-physiological constitution of experience as a concept of knowledge production is inextricably linked with practices of bourgeois self-assurance, in the sense of social, racial, sexualized and gendered subjectivation. The figure of the child stands in its peculiar particularity, extraordinarily, as a proxy for mankind as a whole: It was elevated into a universal anthropological condition by working as a thought experiment of a special phase of human development. Scholars tried to comprehend differences in the capacities to train one's cognition and gain understanding of abstract knowledge by reference to diverse subjectivities, but all of those sustained the idea of "the proper way" and "the most capable subject" at the center of society – namely, the "man".

The anthropologically defined impressions of experience were understood to be pictorial: The external physical image was regarded as impregnating the child with an internal image of the imagination. "Learning to see" arose to be the most influential metaphor of bourgeois subject formation. In the context of the anthropologization of the senses, it was assumed that the development of mind and cognition was accompanied by controlling one's sense of seeing, with the help of the comparative and all-encompassing gaze, the subject which distanced itself from the object of observation. Consequently, a process of personal differentiation from the world of objects was initiated. As we have seen, Bertuch and philanthropic educational scholars' sensory training programs together with their theories of "the proper way to see" correlated with the new inductive methods within the natural sciences. Highly influenced by the empiricist and sensualist cognitive theories of their time, they envisioned pedagogic influence as the necessary governance of the child's senses. Child and image functioned as a productive unity within the bodily materialization of experience: This physical modeling of the child's body (e.g. nerves, senses and brain) and the moral modeling of his behavior (e.g. gendered, racialized, social performance and manners) worked also via images in the form of copper plates and drawings. I would like to propose that we view this sensory training (with educational practices of, for example, collecting, observing and visual comparison) as an aesthetic modeling. It proceeded through the correlation of (the child's) imagination ("*Einbildung*"), the image ("*Bild*") and education ("*Bildung*"). In light of this historical conjuncture, it becomes apparent and far from random how the German word "*Bildung*" derives from "*Bild*." Vividness was thought to make experience visible *as* an image *within* the image so that it could leave a lasting impression. "Making experience" as epistemological method and an anthropological condition quintessentially possessed a pictorial dimension. The debates about experience also brought its representational capacities to the table, because experience was

already the synthesis of sensory impressions and cognitive knowledge from an empiricist and sensualist perspective. Having this close correlation of child – image – experience in mind, it becomes apparent that the aesthetic and scientific-political investments of the experience-concept work strongly and in a self-evident manner.

Notes

1. See Bertuch's big pictorial projects with August Johann Carl Batsch, Professor of Botany in Jena: *Tafeln der allgemeinen Naturgeschichte nach ihren drey Reichen* (Bertuch 1801b), *Grundzüge der Naturgeschichte* (Batsch 1801a) and *Grundzüge der Naturgeschichte des Gewächs-Reichs*. (Batsch 1801c), *Grundzüge der Naturgeschichte des Mineral-Reichs* (Batsch 1801b), *Grundzüge der Naturgeschichte des Thier-Reichs* (Batsch 1801c). After Batsch died in 1802 and out of economic and political necessity due to the revolutionary and Napoleonic Wars, these projects had to be canceled. However, in the years 1806 and 1807, Bertuch produced 15 new volumes.
2. The discovery of the sensibility of the nerves by the Swiss anatomist and physiologist Albrecht von Haller triggered a Europe-wide debate which deeply influenced medical, philosophical and cognitive-theoretical body/mind concepts within the second half of the eighteenth century. As a result of his many experiments on animals, von Haller attributed specific characteristics to organic structures (muscle–irritability; nerve–sensibility) and, consequently, postulated a separation between the formerly entangled spheres of movement and sensation (Boury 2008).
3. Here, the German contemporaries clearly followed Francis Bacon's conception of "*experientia ordinata*" in his work *Novum Organon* [1620] 1990. According to Bacon, experience was now conceptualized in contrast to knowledge that was handed down. New knowledge was sought to be created by experimental situations. See, for example, Bontekoe ([1685] 1688) and an analysis of Bontekoe in Chakkalakal (2014, 49–50).
4. These two historical dimensions – an ontogenetic history of the individual and a phylogenetic history of society – are articulated in Bourdieu's concept of habitus: "Habitus, as a structuring and structured structure, engages in practices and in thoughts practical schemata of perception issued out of the embodiment – through socialization, ontogenesis – of social structures, themselves issued out of the historical work of succeeding generations – phylogenesis" (Bourdieu and Wacquant 1992, 139).
5. Étienne Bonnot Condillac radicalized Locke's empiricism in his first tractate *Essai sur l'origine des connaissances humaines* (1746). He equates the Lockean "sensation" with the "reflections"; while Locke thought dualistically of two sources of cognition, Condillac condensed them into one. The figure of the child plays an essential role in this thought process, and its deployment temporalizes cognition into a process: "§. 3. Let us consider a man at the first moment of his existence. His soul first has different sensations, such as light, colors, pain, pleasure, motion, rest – those are his first thoughts" (Condillac 1746, 2–3 [transl. by Aarsleff in Condillac 2001, 11]). In addition to the child, Condillac used the thought experiment of the Pygmalion statue to emphasize his developmental argument about cognition. Consequently, he assigned hierarchical status to the five senses in successive order as follows: putting the sense of smell first and the sense of touch last (Carr 1960). This processual understanding of childhood that initially produces the phenomenon of temporalization makes Condillac's thinking interesting for Rousseau. Because Condillac understands the cognition process in a temporal manner, Rousseau's educational question of how we can generate sense-based experience-knowledge from sensibility becomes essential (Chakkalakal 2014, 78–104).
6. Rousseau's recommendation for educators and parents to give their students Daniel Defoe's *Robinson Crusoe* (1719) led to the fact that the Robinson motive was transferred into various German adaptations, and Defoe's novel itself was republished many times (Stach 1996,

8–17). The most well-known adaption at that time is by the German educator J. H. Campe ([1779/1780] 1981). Johann Karl Wezel's (1779) adaptation is as famous.

7. Reill describes 12 aspects of the vitalistic concept of nature in contrast to mechanistic concepts (1994).
8. "*En effet, plus on diminue le nombre des principes d'une science, plus on leur donne d'étendue; puisque l'object d'une science étant nécessairement déterminé, les principes appliqués à cet objet seront d'autant plus féconds qu'ils séront en plus petit nombre. Cette réduction, qui les rend d'ailleurs plus faciles à saissir, constitue le veritable esprit systématique, qu'il faut bien se garder de prendre pour l'esprit de système avec lequel il ne se rencontre pas toujours.*" (Diderot and d'Alembert 1751, vi).
9. Original French title: *De la Maniere d'etudier & de traiter l'histoire Naturell*.
10. "*Dem Vorwurf der Trockenheit in den Beschreibungen kann dadurch vorgebaut werden, wenn man dieselben, durch Einmischung einiger Begebenheiten, Vergleichungen oder Betrachtungen über den Gebrauch unterschiedener Teile, belebt; mit einem Worte: wenn man die Sache so abhandelt, daß man den Lesern sowenig Langeweile, als tiefes Nachdenken verursacht*." (Buffon [1749] 2008, 31; my emphasis).
11. Compare the analogy in Buffon (1749, 8 [transl. Lyon 1976, 147]): "In addition, the minds of young people ought to be presented with things of all kinds, with all manner of studies, and with objects of all sorts, so that they might be able to recognize the type toward which their mind tends with greater inclination, or to which they would devote themselves with greater pleasure."
12. "The whole apparatus of the leaves and flowers in its utmost simplicity is already extant within the buds or the eyes of the plants." (Funke 1796–1833, Bd. 16, 1815, S. 206–207 [transl. S.C.]).
13. Please see a detailed image analysis with additional copper plates from the *Picture Book* in Chakkalakal (2014, 320–351).

Acknowledgments

I wish to thank Geert Thyssen and Ian Grosvenor for their invitation to contribute to this special issue of *The Senses and Society*. I am particularly indebted to David Howes as well as the two anonymous reviewers for their many incisive and helpful comments on an earlier draft of this paper.

Disclosure statement

No potential conflict of interest was reported by the author.

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