

'There is a fuzzy item over there'. But the existence of the former is by no means sufficient in itself to achieve the latter.

By retreating into the world of its seemings, \mathbb{K} has come to possess an INFANTILE-world where what merely seems to be the case (from \mathbb{S} and \mathbb{M} 's viewpoint) is actually the case (from \mathbb{K} 's perspective). But this world is not sustainable for long either, in so far as \mathbb{S} and \mathbb{M} are not just reporters and confirmers of \mathbb{K} 's world-representings. Since they are full-blooded concept-havers who possess the ability to make objective judgements, their reports stand in sharp contrast to \mathbb{K} 's mere seemings. To again recohere what is now a decohered infantile world, \mathbb{K} has to remove the quotation marks from its meta-awarenesses while restoring the labels. To put it crudely, \mathbb{K} must construct a world-picture composed of various contrasting partial world-pictures. Inhabiting this new world of contrasting partial world-pictures is tantamount to occupying a self-critical position. From now on, instead of deriving

the fuzzy item is to the left of the heap of black

from the quoted and guardians-tagged or labelled meta-awareness

**the fuzzy item is to the left of the heap of black* $\ast_{\mathbb{S}}$ *is*

\mathbb{K} instead starts to label the world-representation t_1 as *S-inferred* while removing the quotation marks from its awarenesses:

the fuzzy item is to the left of the heap of black \mathbb{S}

In addition to *S-inferred* world-awarenesses that correspond to the meta-awarenesses that mention them, \mathbb{K} is also in possession of *M-inferred* world-awarenesses. In the growing repertoire of these reported world-pictures or labelled awarenesses, \mathbb{K} 's unlabelled awarenesses—that is, its pure perspectival seemings, its dispositional transitions, impressions, memories, and anticipations—are perpetually being updated. Put differently, with the establishment of this data bank of labelled world-awarenesses reported by

its adult guardians, \mathbb{K} becomes susceptible to appraising its experiences in the broadest possible sense. It is with the development of this increasingly aperspectival world-picture assembled out of *external* partial world-pictures whereby the CHILD comes to inhabit an 'objective self-critical stance'¹⁹⁹ that Rosenberg's argument, as summarized above, concludes.

However, a question arises here: If we take the linguistically informed reports of \mathbb{S} and \mathbb{M} as logical forms, how can we postulate that \mathbb{K} 's combination of its rudimentary representations according to this logical form is sufficient to render what is only subjective in a thin sense (i.e., dependent on the mutable variations of the empirical reproduction of *uncritical* associations) as objective (i.e., critical invariants of judgements as occurring in virtue of the necessary unity of apperception)? The answer is that the objective unity of apperception effected by this logical form is the unity of apperception, which does not conform to a *single* object. It is instead that which relates the CHILD's representations to an object (i.e., this such-and-such...) 'as generically identical to all those whose apprehension depends on the same rule'.²⁰⁰ In doing so, the objective unity of apperception configures or structures *combinations* of representations which, in the words of Béatrice Longuenesse, 'tend to truth, but may in fact be true or false'.²⁰¹ In this sense, objectivity is nothing but the combination of representations which conform to the object according to a logical—rather than empirical—form, and thus can be said to be tending to be true (i.e., veridical) or to have epistemic status despite the fact that they may be wrong. It is this 'tending to be true or false', and hence the propensity toward further corrections, whether within the order of appearances or as a means to go beyond the appearance, that is the kernel of objectivity. However, in contrast to Longuenesse's distinctly Kantian understanding of objectivity only in terms of factual objectivity—i.e., intentional relation to sensible objects in general—and categorial objectivity, which lacks such an intentional relation

199 Rosenberg, *The Thinking Self*, 145.

200 B. Longuenesse, *Kant and the Capacity to Judge* (Princeton, NJ: Princeton University Press, 1998), 49.

201 Ibid., 82.

(mere flux of perceptual episodes), we can posit a third form of objectivity: the objectivity of logic or the formal structure of thinking.

Whereas Kant restricts the formal reality of thinking (logic and language) to the correct applications of logical rules to sensible intuitions and representations, and thus limits the scope of logic to a canon by rejecting the notion of logic as an organon—the condition of possibility of all sciences and world-related claims—this book argues that the most fundamental form of objectivity is logic as an organon. Both factual and categorial objectivity are predicated upon logical forms as a necessary condition. As we shall see in chapter 7, only by treating logical forms in their own terms, without either transcendently subjecting them to the combinations of representations or assuming a metaphysical correlation between logical forms and an external reality, can we renew the link between mind and world, intelligence and the intelligible, or theory and object. This is to say that the unbinding of language and logic from concerns about representation and even meaning—a thesis put forward by Rudolf Carnap and set in motion by research into artificial and formal languages—is the very recipe by which reality can be structured differently. In this sense, it is the exemplar of the critique of transcendental structures whereby a new form of intelligence can be objectively postulated and in principle constructed. The worldbuilding of the formal dimension of language and logic is prior—not just in the order of precedence but also that of constitution—to world-representation.

AS IF RAISING A CHILD

The import of labelled meta-awarenesses and their corresponding labelled world-representations goes far beyond this generative tension between *K*'s world-picture and an objective world-history as reported by *S* and *M*—a tension that continually decoheres and recoheres the child's world toward what is ultimately an objective critical position. This transition to a theoretical critical stance is, however, only possible to the extent that it is built on a practical critical stance: a formal practical autonomy or minimal self-determination that distinguishes the child from mere sentience.

To see the import of labelled world-representations qua aperspectival partial world-pictures—as outcomes of S and M's communications—only in the light of what eventually becomes a theoretical objective self-critical stance is to ignore the formal practical autonomy of the child. It is this autonomy that makes the generative tension and ultimately the theoretical objective stance possible, not the other way around.

Understanding the relation between the child Kanzi and its adult language-using guardians—in the fashion of Sellars and McDowell—as simply a relation between the trainee's ought-to-be and the trainer's ought-to-do betrays an indefensible disregard for what the child actually is: a form of practical autonomy that makes this relation possible in the first place. It is indefensible because it reduces the child to a mere sentience that must be trained into a second nature; and because it leads to an account of education as either a collection of *minatory oughts*²⁰² or, worse, a guiding system of rewards and punishments. This is, of course, a patently false idea of education that originates not from the infantility of the child but only from the myopia of the adult with respect to the child. Education is firstly the cultivation of recognition; only then can it be a generalized pedagogy for the cultivation of cognitions.

The child is distinguished by its will-to-autonomy: a practical proclivity to be recognized by the adult as the one who yearns—in the Platonic sense—to develop, to learn language and ultimately be a full-blooded agent. And it is precisely in virtue of this yearning or will-to-autonomy—which can be fleshed out both in naturalistic and normative terms—that seeing a prelinguistic child as a mere sentience who is yet to be culturally conditioned is fundamentally ill-judged. The distinction between a child or a prelinguistic infant and sentience is a categorical distinction. The yearning

202 Minatory oughts, according to Findlay, are obligations which urge one not to do something without necessarily urging one to do something. Short of complying with such oughts one may incur exclusion, reprimand, or punishment (e.g., one ought not to be loud in a public library and its corresponding codified imperative, Don't be loud in...). See J.N. Findlay, *Values and Intentions: A Study in Value-Theory and Philosophy of Mind* (London: Routledge, 1968).

of the child—whether as an artificial agent or any sentient that exhibits precisely such tendencies—for development and recognition should be taken as a matter of categorical fiat or an a priori rule as distinguished from sociocultural conventions and natural laws. Whether or not a child is isolated from an environment that makes the learning of language possible, whether or not it is impaired by disabilities, it ought to be recognized as one who has the *nisus* or tendency to become a fully fledged language-using autonomous agent. This identification of the child as a yearning agent is a matter of a priori rules which admit of no exception, in so far as they are universal and necessary. In this respect, the recognition of children as agents endowed with the will-to-autonomy must be applied to all children not only regardless of their abilities or lack thereof, but regardless of whether they are human, artificial, or otherwise. This is a matter of *categorical* or a priori distinction. Logic, broadly understood as the comprehensive system of cognitions, and ethics, broadly understood as the system of recognitions, coincide and are indissociable. As we shall see in the following chapters, the unconditional broadening of logic and language as an organon is commensurate with the expansion of the axiological posits of ethics for a logically autonomous self-conceiving and self-transforming intelligence.

Simply put, autonomy is not the end product of education, but that which affords education as its self-cultivating vector. Attending to the autonomy of the child is, therefore, the first step of education:

It is through attention that spirit first becomes present in the matter, acquires it, by gaining information about it. It does not yet gain cognition of it however, for this requires a further development of spirit. It is therefore attention that constitutes the beginning of education.²⁰³

Let us unpack what has been argued so far: In recognizing world-representations communicated by \mathbb{S} and \mathbb{M} as representations that are mapped to its meta-awarenesses, \mathbb{K} recognizes these labelled meta-awarenesses and their

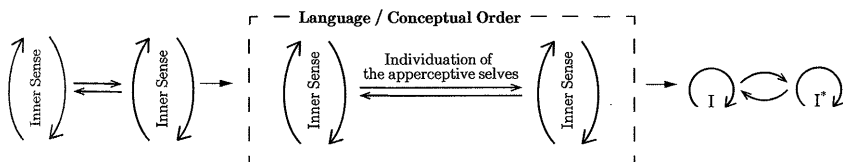
203 G.W.F. Hegel, *Hegel's Philosophy of Subjective Spirit*, tr. M. J. Petry (3 vols. Dordrecht: D. Reidel, 1978, 3 vols.), vol. 3, 125.

corresponding world-representations *as its own*. More plainly, in recognizing what S and M communicate (i.e., rudimentary linguistic interactions), and to the extent that S and M's reports *engage* its infantile world, K recognizes the corresponding meta-awarenesses of such reports—which were only de facto its own from our perspective—as *its own* meta-awarenesses. The labelled or tagged meta-awarenesses and their correlated world-representations, consequently, function in at least two ways. They not only impute a proto-inferential structure to the meta-awarenesses and awarenesses of items in the world (world-occurrences)—they also, and more importantly, enable K to *recognize* such labelled meta-awarenesses as awarenesses which it already de facto had, but which are now de jure and by entitlement its own. K's recognition of that which is other but for now is commensurate with its infantile world leads to the recognition of this infantile world of experience as its own experience. In a nutshell, K is now an infant apperceptive self, a formally rather than causally conditioned *I*.

At last, K is able₂ to recognize its meta-awarenesses and their corresponding awarenesses, together with their transitions and obstructions, as its own. It is an *I* that synchronically attaches itself to diverse thought-episodes qua recognized meta-awarenesses of world-awarenesses. But since meta-awarenesses constitute a network of equivalence relations that diachronically extends through time, the *I* that synchronically tags different meta-awarenesses is formally identical or equivalent to the *I* that diachronically is carried over and accompanies *all* meta-awarenesses under one integral framework: the synthetic unity of apperception.

It was argued above that, were Kanzi to be raised to the status of CHILD, it would have the ability to report, mention, or quote (in the sense of the dot-quoting discussed in chapter 3) its meta-awarenesses to *itself*, as its private thoughts. $K(*I_0 \text{ be}_1 \text{ be}_1 *)$ is $K(*I \text{ think } *)$. The apperceptive self—I as a logical form of thought rather than as substantive or phenomenal self—is essentially a process of individuation afforded by a space of shared recognition, here between Kanzi and its language-using custodians. But this shared recognition need not be mistaken for the liberal narrative of mutual recognition, since it is primarily a *formal* condition of a deprivatized mind where the public semantic space of language, the movement of

self-consciousness, autonomy, and will are tightly knitted together. Recall this remark from the first chapter: Perception is only perception because it is apperception, and apperception is only apperceptive in so far as it belongs to a deprivatized semantic space in which recognitive cognitive agents are individuated. The synchronic and diachronic I of cognitions is necessarily a constructed and constructible object of recognitions.



The space of recognitions as the formal condition for the individuation of the nonsubstantive I—the thinking self—is by definition composed of mutual recognizers. Unlike the non-apperceptive self or empirical consciousness, which is differentiated by the sensible external item of which it is aware,¹ the apperceptive self is differentiated by *objectivity* (or objective validity), which is independent of any single experiencing subject, but is not independent of geist in the intertwined senses of the dimension of structure and a community (i.e., a system of recognitions) of language-using agents bound to norms governing the application of concepts to their de facto inner-sense reports. It is through this objectivity, which is but the copula of mind and world, that the apperceptive I is individuated: I am I, all thus-and-so apprehendings are mine, an apperceptive self ‘cognizing each object as a member in the system of what I am myself’.²⁰⁴ I possess ego and world all in one and the same consciousness, a consciousness that recovers and sees my self in the world. This objectivity expresses the entanglement between the object (*gegenstand*) and the norms of objective validity given by mind in the aforementioned two senses. This unity (which does not suggest fusion) of object and ego is the constitution of what Hegel calls the ‘principle of spirit’.²⁰⁵

204 Hegel, *Philosophy of Subjective Spirit*, vol. 3, 39.

205 Ibid.

To this end, it is not just that Sue and Matata recognize Kanzi as a child who should be cultivated by various oughts. Kanzi itself also not only recognizes them as objects of the utmost significance; as it grows—being recognized as such—it recognizes them as subjects essential for the cultivation of its subjectivity. In fact, it is Kanzi's recognition of its adult communicants that is of paramount importance here, for without the key functional role of this recognition, there would be no apperceptive self, no thinking I, no I-thoughts. But what exactly is this key functional role, what does the child's act of recognition of its adult guardians signify? The answer is that this act of recognition is precisely the autonomy of the child itself—the form of practical will qua principle of subjectivity as such. Even though this will is minimal and formal—rather than fully actualized and concrete—it is, by itself, powerful enough to give rise to the formally self-conscious I.

However, we should avoid confusing will (*wille*) with the capacity for choice (*willkür*), since the former is a logical form of practical autonomy while the latter is an index of relative autonomy which, upon closer scrutiny, turns out to belong to the order of causes where autonomy is at best relative or conditioned, and in reality nonexistent.²⁰⁶ The will of the child is the formal principle of its autonomy. It is the will to go beyond itself and to recognize that which recognizes it. Short of the minimal act of self-determination whereby the child first looks for its central objects of interest beyond itself and then takes these objects of mere interest as subjects necessary for its self-cultivation—its self-critical stance—there would be no thinking self. Kanzi's recognition of Sue and Matata's communication is not an arbitrary or contingent deed that can be dispensed with as a mere instance of conditioned behaviours and dispositional interests. It is a necessary and universal condition not just for the adult guardians' recognition of the child as that which can be cultivated, but also for the generation of subjectivity as such.

The will qua power to act first manifests itself abstractly in the self-certainty of a conscious ego as a completely indeterminate ideality. But this

206 See R. Negarestani, *Causality of the Will and the Structure of Freedom* (2017), <<http://questionofwill.com/en/reza-negarestani-2/>>.

abstract self-certainty is the germ of an indispensable process whereby the ego begins to repulse or negate itself in favour of that which is outside of it, individuating itself 'outside in'. In its most elementary form the will of the child arises from its sense of self-certainty which, being abstractly free of all limitations, begins to abstractly differentiate itself from the other, the world.²⁰⁷ This abstract self-differentiation, however, also renders the child prone to the recognition of what is outside of it, a process of concrete self-consciousness that does not end with reaching adulthood or coming to possession of linguistic abilities. Now, in order for the child to abstractly determine, establish, or ascertain the self-certainty of its ego, it must act upon the very recognition of what is outside of it. The formal and abstract will is precisely this power to act on the recognition of an external world (of things and communicants) as a necessary requirement for preserving the self-certainty of the ego. It is in fact the very nature of the ego:

In that I posit this being as an other which is opposed to and at the same time *identical* with me, I am knowing, and possess the absolute certainty of my being. This certainty ought not to be regarded, as it is from the point of view of merely presentative thinking, a kind of property of the ego, a determination pertaining to the nature of it. It is to be grasped as the very nature of the ego, for the ego cannot exist without distinguishing itself from itself and remaining with itself in that which differs from it, that is, without being aware of itself, possessing and constituting its own certitude. Certainty therefore relates itself to

207 'Initially therefore, the ego in its self-certainty is still that which is *quite simply subjective*, that which is *free* in a *wholly abstract* manner, the *completely indeterminate ideality* or negativity of all limitation. Thus, in the first instance, the ego's self-repulsion only yields it that which differs from it *formally*. It does not yield an *actual* difference. As is shown in the Logic however, *implicit* difference has also to be *posited*, developed, into actual difference. With regard to the ego, this development takes place in the *following* manner. In that it does not relapse into what is *anthropological*, into the unconscious unity of the spiritual and natural, but retains its self-certainty and maintains itself in its freedom, the ego allows its other to unfold itself into a *totality* equal to its own [...]' Hegel, *Philosophy of Subjective Spirit*, vol. 3, 7.

the ego as freedom relates itself to the will, the former constituting the nature of the ego as the latter the nature of the will.²⁰⁸

But in willing to abstractly recognize the other so as to formally ascertain itself, the child unknowingly opens its world to a process of disintegration and reintegration which, as we saw, culminates in the occupation of an objective critical stance, a point of no return called maturation.

In *Values and Intentions*, Findlay speaks of certain 'essential drifts of consciousness'.²⁰⁹ That is, as soon as the recognitive consciousness—a consciousness that determines itself by recognizing that which it is not—is realized, it drifts toward what is impersonal and disinterested (*ohne alles Interesse*). It is only in the wake of this drift that self-consciousness comes into the picture, first formally and then concretely. This is self-consciousness in the sense described in chapter 1, i.e., $I \rightleftharpoons I^*$. At its core, this drift is the expression of the abstract form of the will qua practical autonomy. The possibility of the realization of 'I think' for the child, its eventual arrival at an objective critical position, rests upon the child's formal practical autonomy: the will to ascertain its self by drifting toward what it is not. What appears from the stationary viewpoint of the adult as the passive child is, from the standpoint of this conscious drift—the child's self-determination—entirely active. Owing to this practical autonomy, this self-determination which belongs to the formal order of the will, the child's world becomes a universe of deracination, its consciousness a drift toward actual self-consciousness. And it is through the formal will, i.e., through recognising that which it is not and interestedly acting upon this recognition, that the child becomes a thinking will or a will to think:

The determination of the implicit being of the will is to bring freedom into existence within the formal will and so to fulfil the purpose of the latter, this purpose being to fulfil itself with its Concept, that is to make freedom its determinateness i.e. its content and purpose as well as its

208 Ibid., 5–6.

209 Findlay, *Values and Intentions*, 219.

determinate being. Essentially, this Concept, which is freedom, only has being as thought; the will makes itself into objective spirit by means of raising itself to thinking will, by endowing itself with the content it can only have as self-thinking will.²¹⁰

Therefore, education is not a matter of graduating the child into the space of reasons, but one of recognizing and cultivating its will-to-autonomy. Absent this, the relation between the adult and the child is exactly the *one-sided* relation between master and slave which demolishes the will of the latter, reducing it to a will-to-survive and a perpetual dependency.

Like all children, raising the child-AGI necessitates both recognition and cultivation of the will-to-autonomy, whose fabric is woven by reason and freedom. The autonomy of the child is both the freedom *to* do something according to reasons, and freedom *from* the limitations imposed by our one-sided view of who the child should be or become. The maxim put forward in chapter 3 in the context of giving rise to that which is better, whoever or whatever it may be—*liberate that which liberates itself from you*—communicates the recognition of the child's will-to-autonomy as the imperative of the concrete self-consciousness. Without the dynamic implied in this imperative, all we have is an abstract self-identity, an immediacy of autonomy which is but an illusion begotten by a one-sided subjectivity. In this regard, the two-sided dynamic between children—whether conceived in the context of artificial general intelligence or that of existing humans—and adults, between the current generation and the next generation, is the first and final frontier of that struggle which is concrete self-consciousness—the actualization of the concept of the human into its Idea.

Kanzi the automaton is not born into the full-blooded status of general intelligence. It can only come to occupy that position as a child, one whose formal autonomy must be recognized and cultivated. This formal autonomy or self-determination harbours no supernatural mystery. It is the result of being born into a language-laden cognitive space and supported by the

210 Hegel, *Philosophy of Subjective Spirit*, vol. 3, 231.

'right sort of mechanisms'.²¹¹ It is through education that Kanzi, the child, can arrive at the qualitative status of general intelligence. But education, as that which transforms the formal will into a thinking will, cannot be properly conceived without recognizing that the child already has a capacity for self-determination.

Just like raising a human child into the position of an objective self-critical stance, raising the child automaton Kanzi first requires the cultivation of its recognitive abilities through the augmentation of the space of mutual recognition. The role of its educators is not simply to issue guiding imperatives. It is rather to cultivate its practical autonomy by assisting it to navigate this recognitive space and to facilitate new encounters with the world through which the child can stumble upon rewarding surprises. In short, the primary task of the educators is to stimulate and reinforce the child's openness so as to expand the range and diversity of such encounters, thereby incorporating objectivity—that is, external reality—into its consciousness. But the cultivation of this attitude toward the objective which makes possible the individuation of the thinking self and the actualization of self-consciousness entails the cultivation of the child's structuring abilities, or the dimension of conceptualization. Intelligence can only be recognized and cultivated in the presence and expansion of the intelligible, and what is intelligible can only be cognized and acted upon by intelligence as the vector for the development of mind as the dimension of structuration. In line with this proposition, absent structuration as the function of mind and language through which this objectivity becomes completely articulable or expressible, objectivity as the universal element of self-consciousness is only an empty thought. However, as per the brief discussion in chapter 1, language here need not be understood as natural language, but should be conceived more broadly in terms of syntactic and semantic complexity.

211 '[H]uman beings are creatures with freedom and dignity. In fact, I will maintain, it is not in spite of being comprised of mechanisms, but in virtue of being composed of the right sort of mechanisms, that human beings are such creatures.' W. Bechtel, *Mental Mechanisms: Philosophical Perspectives on Cognitive Neuroscience* (London: Routledge, 2008), 3.

Just as a sensible particular item, for ourselves as for the child-AGI, is an inceptive givenness from which we depart and mature toward objectivity, so natural language is also a givenness from which we should depart in search of a new form of language—one that is at once more expressive and more semantically transparent.

It is in this environment that the child also learns to take pleasure in the continual disintegration and reintegration of its world in the constitution of an objective self-critical stance: a position that intrinsically admits objective rules, impersonal values and disvalues, for a concomitant process of the learning and unlearning of both ought-to-dos and ought-to-bes. This process involves the initiation of the child into the space of language as much as its acquaintance with the extant conceptual resources of a given language.

Perpetually uprooted from its familiar world, its supposed natural home, Kanzi is now an object of practical freedoms. It might at times be sad that it has left behind its comforting familiar habitat, but it is only sad to the extent that it has the capacity to be happy about what it can do. And what it can do is a matter of restless exploration. It is able to select one set of purposive actions over another in so far as they conform to and satisfy its time-general thoughts. It prefers to foray into the open, to eat, beneath the stars, a marshmallow toasted over a Promethean fire that it has made for itself. Rather than participating in the endless orgies of nature, it chooses to play video games to enhance its cognitive abilities, but also out of a sheer unprecedented excitement that enlarges its field of experience beyond the boundaries of what is naturally given to it. For Kanzi, the *automaton spirituale*—the it—that thinks is now the I, or we, that thinks.

GLOBAL PEDAGOGICAL PROJECT

Before developing the toy universe of our infant general intelligence any further, let us briefly consider what a complex system of generalized pedagogy for this child might look like. A generalized pedagogy for the global education of the child—or in this case, a *child-machine*—can be precisely understood as a complex system, a hierarchical network structure

or multilevel web comprised of various interacting modular subsystems.²¹² Additionally, the modularity of these subsystems can be horizontal or vertical. Horizontal modularity implies that a system can be decomposed into a set of distributed modules whose dynamics and interactions produce the overall system dynamics. Vertical modularity implies instead that the system dynamics can be decomposed into the interactive product of its dynamics at different—i.e., structurally and functionally distinct—constraint levels.

Both types of modularity possess inter-modular as well as intra-modular interactions, but the difference between the two lies in their specific trade-offs. In horizontal modularity there is a trade-off between, on the one hand, the flexibility of modification and the cost of change in the overall structure and, on the other, the complexity of structure and function. In other words, systems exhibiting horizontal modularity are more flexible to change, and modifications to their existing structure tend to be less costly than vertical modular systems. In contrast, vertical modularity supports more complex structural and functional configurations. However, the trade-off here is that, as inter- and intra-level constraints pile up—the process of so-called generative entrenchment—the diversification of structure becomes more difficult and the modification of lower-level modules becomes more computationally costly. In other words, here the trade-off is between constructability and complexification on the one hand, and diversification and the possibility of error or bias-correction at lower levels on the other. Nevertheless, it is precisely because of this entrenchment of existing constraints that complexity of function increases.

The complex system of generalized pedagogy should be comprised of such modular systems; the modules might be cognitive regimens and tasks, different methods and techniques of training and learning, or even models of cognition and practice. As a multilevel network, the pedagogical system should not be taken as a fixed catalogue, but as a web plastic and robust enough to permit the plugging in of new modules or the alteration

212 On the concept of the child-machine and education, see A. Turing, 'Computing Machinery and Intelligence', in B. Jack Copeland (ed.), *The Essential Turing* (Oxford: Oxford University Press), 441–71.

and removal of existing ones. Moreover, the system should allow the integration of various learning processes and the accumulation or revision of their outcomes, as well as affording rules, methods, and techniques for unlearning what has been previously learned. Education and learning should be understood as bias and error-tolerant systems. Sometimes different cognitive biases—inbuilt inductive biases, experimental biases, etc.—can be exploited to make possible a more complex cognitive skill or to make accessible to the child a method, technique, or topic of education that would otherwise prove difficult to master. At other times such biases should be restricted or completely removed.

Any mode of learning that either *globally* preserves biases and error, or attempts to completely remove them to achieve absolutely optimal results, should be rejected. This is, however, a thorny issue, particularly when it comes to vertical modular structures, since, owing to accumulative constraints, biases tend to be transferred from lower to higher levels and become fully entrenched. Therefore, from the standpoint of computational-cognitive cost, it would be extremely difficult for both educator and learner to remove such biases, or the mechanisms responsible for them, at lower levels. A possible solution perhaps would be to limit rules to the minimum necessary set at the initial stage of education, while implementing a diversified list of mixed techniques and methods. The reason for the latter is that, were global or less diverse learning techniques and cognitive regimens to be adopted, the techniques and methods might be inflated into models of cognition for the learner. The learner is always liable to mistake a particular problem-solving technique for a global model valid for solving not just similar problems but every problem, and hence to transfer the specific biases of techniques and methods into global models by means of which problems are detected, approached, analysed, and tackled.

The primary goal of the generalized pedagogical system for the child AGI should be to provide the child with the necessary and sufficient wherewithal to form an increasingly complex structuration of the world in all its complexity. This is a structuration through which new modes and ranges of thinking and action (what can be thought and done) are continuously being uncovered. Structuration—which, essentially, is the function of

mind—aspires not only to render the world intelligible, but also to disclose new orders of intelligibilities as pertaining to things, thoughts, practices, and values. In other words, the primary goal of education and generalized pedagogy is the functional re-realization and augmentation of what mind already is: a unifying structuring point or configuring factor in which the coextensive complexity of the theoretical-practical subject and the world in its radical otherness are expressed.

‘What ought to be thought and done combined with what the world in its complete unrestricted conception is’—this is a formula for what *could possibly*—in the remotest sense of possibility—be thought and done. It is precisely the regulative ideal of education. Education is, in this sense, the self-realization of mind as a *project* rather than as a thing or a given nature.

Education is the project of all projects, an undertaking without which no other project—be it ethical, scientific, or political—can either sustain itself or be tenable. Understanding and realizing the mind as an edifice of structuration (of both the world and thoughts and practices) culminates in the discovery of what else can be thought and done—that is, pushing back the boundaries of *all* practical abilities. But this unbinding of all practical abilities of mind is what concrete freedom actually is. Education, then, ought to be grasped as a process of scaffolding for developing abstract autonomy into concrete freedom. This transition is what Hegel regards as ‘the quaking of the singularity of the will’ that is ‘the necessary moment in the education of everyone’.²¹³ Every other undertaking or project can only be thought in terms of a task that is supported and sustained by this scaffolding that needs to be continually raised.

Education, therefore, should be treated as a complex and dynamic recipe for providing the necessary and sufficient wherewithal for the structuration of the world that the subject inhabits. In outlining education as the extension of the project of mind in its drift toward concrete self-consciousness, we can think of a list of the cultivating vectors and regimens that define the broad tasks of a generalized pedagogy of the child AGI. This generalized pedagogy, however, is more like a primary education through which the

213 Hegel, *Philosophy of Subjective Spirit*, vol. 3, 67.

child AGI comes to recognize the necessary correlations between mind and world, structure and being, intelligence and the intelligible, theory and object. Practical and axiological education—praxis and ethics—are left out for two simple reasons: (1) Investigating the complexity of practical and ethical education are beyond the scope of this work; (2) praxis and ethics, and logic understood as the general organon of mind are ultimately two sides of the same coin. No form of praxis or ethics can dispense with the question of intelligibility, which is but the question of structure as the dimension of mind through which it can establish and renew its relations—theoretical, practical and axiological—with the world—a renewal which is tantamount to the transformation of the mind itself.

Even within the ambit of mind as the edifice of structuration or logic, this list is by no means exhaustive, but merely schematic. It is only an attempt to sketch the rough outlines of what the global pedagogical project entails. We can broadly think of this program in terms of the realization, augmentation, and composition of two interconnected sets of abilities, the semantic and syntactic abilities of mind required for the structuration of world, and the thoughts and actions that occur within it.

We can denote *structuring semantic* (meaning) *abilities* as *sm*-abilities and *structuring syntactic* (formal or axiomatic) as *sf*-abilities. Once again, it would be helpful to remind ourselves that, generally speaking, structure is the 'differentiated and ordered interconnection or interrelation of elements or parts or aspects of an entity, a domain, a process, etc. Structuration in this sense involves the negation of both the simple and the unconnected'.²¹⁴ Or, to appropriate Sellars, *how and what things in the broadest possible sense of the term hang together in the broadest possible sense of the term*.²¹⁵

Since these syntactic and semantic abilities can be composed to yield compound structuring abilities, let us additionally denote this process of composition by the operator \odot which maps functions to functions, or abilities to abilities. \odot_{mf} is then a compound within which an element of

214 Puntel, *Structure and Being*, 27.

215 See W. Sellars, 'Philosophy and the Scientific Image of Man', in R. Colodny (ed.), *Frontiers of Science and Philosophy* (Pittsburgh: University of Pittsburgh Press, 1962), 35.

a semantic ability increases the complexity of a syntactic ability. Respectively, \odot_{fm} is a compound structuring ability in which an element of a syntactic (formal axiomatic) ability together with its constitutive rules is applied to a semantic ability. Take for instance, 'Logic-Mathematics (*modality*) \odot_{fm} *sf*-ability (*applying a modal vocabulary*) \rightarrow *sfm* ability (*more complex structured material inference*)'. It roughly reads as 'the compound semantic-syntactic ability to form a better material inference involves the introduction or application of a modal element (a modal relation) from formal domains of structuration, logics and mathematics, to the semantic ability of knowing what it entails to deploy a modal vocabulary and thus to say or judge something with it'. And correspondingly, ' \odot_{mf} -*sf*-ability' approximately reads as 'a structuring syntactic ability assimilated into and augmented by a semantic ability'. This is merely to highlight the fact that the concrete structuring abilities of the mind often come in composite semantic and syntactic forms, and indeed that we can think about the composition and diversification of such abilities in terms of a *combinatorial calculus of objective thinking*. Even though laying out the fundamentals of such a calculus is beyond the scope of this book, *in principle* such a calculus for the diversification and complexification of mind's structuring abilities can indeed be formulated as a curriculum for the education of the CHILD.

Finally, as a last note, the differentiation of semantic and syntactic abilities does not mean that semantic abilities are devoid of syntax or that syntactic abilities lack semantics. It simply means that the emphasis of semantic abilities is on semantic relations rather than on syntactic resources or formal relations, and conversely the focus of syntactic abilities is on the formal and/or axiomatic syntactic structures with an eye to the overall semantic dimension. Both *sm* and *sf* express different but interconnected classes of the mind's structuring function with regard to the world which, as discussed in chapter 1, can be elaborated more coherently and with less metaphysical frills in terms of the copulas of theory and object and structure and being. The consideration of *that which* not only involves the formation of theoretical claims or statements (It is the case that...) but also implicitly or explicitly implies theoretical validity in the sense of theory outlined in chapter 1. Grasping what it means to form theoretical claims and what one

is doing when one asserts or endorses a theoretical claim, in turn, demands the acquisition of language and logoi and acquaintance with the relations between them and the dimension of structure. The cultivation of *sm* and *sf*-abilities, therefore, can be elaborated with reference to the fundamental aspects of theory—the mutual relations between language and logoi (*L*), structure (*S*) and the data under consideration (*U*) provided by *L*—within which objectivity is determined:

(A) *sm*-abilities: Generally, semantic abilities can be characterized as qualitative higher-level modes of cognition. They afford agent models that are qualitatively compressed and therefore economical. Such models are complex and dynamically stable yet small in size (semantics as a qualitative mode of compression). Semantic abilities can be roughly defined as absolutely necessary abilities for the structuration of the world, i.e., the function of the irreducible correspondence of mind-language in relating to the world. Therefore, semantic abilities are abilities that permit the state of affairs concerning *that which* is to be rendered intelligible, thought, or spoken of. Primarily, ontological facts are configurations of semantic facts.²¹⁶ *sm*-abilities mainly involve *conceptualization*. In Brandomian terms semantic abilities can be approximately characterized as those abilities-or-practices necessary or sufficient to obtain semantic relations between vocabularies and those abilities-or-practices necessary or sufficient for deploying vocabularies that stand in semantic relations to one another. Put differently, semantic abilities concern what one must do so as to count as saying something *meaningful*, judging something, or thinking about various kinds of things, and what one must say in

216 'The ontological structures emerge directly from the semantic ones in that [...] semantics and ontology are two sides of the same coin. The fundamental ontological "category" (according to traditional terminology) is the "primary fact"; all "things" (in philosophical terms, all "beings" or "entities") are configurations of primary facts. The term "fact" is taken in a comprehensive sense, corresponding to the way this term is normally used at present (e.g., "semantic fact", "logical fact," etc.). It therefore does not necessarily connote, as it does in ordinary terminology, the perspective of empiricism.' Puntel, *Structure and Being*, 15.