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2.  $p_1, \dots, p_n \in TP$  then “aside from  $p_1, \dots, p_n$  no other proposition is true”  $\in TP$

is erroneous. A version of the latter reasoning begins with the statement “there is nothing true” (RW §11) which can be rendered as “there is no true proposition”, as an example of a true statement, or better yet, the statement “all propositions are false” (WL §31) or “all our judgments are false” (RW §13). Bolzano does not seem to notice that if “all propositions” also includes the proposition “all propositions are false”, then the latter would not be false, and, consequently, the statement “‘all propositions are false’ is true” would not be true. Besides, accepting the statement “‘all our propositions are false’ is true” is just as justified as assuming the statement “‘all our propositions are false’ is false” which is the paradox of the liar. Semantic paradoxes have been known and discussed since Antiquity and the logicians of the Middle Ages developed sometimes very complex versions of the paradox (then called *insolubile*); therefore, it is rather puzzling that Bolzano attempted to derive a set of truths from a statement whose validity was long before him seen as leading to an antinomy. Interestingly, Sextus Empiricus uses a similar proposition to Bolzano’s in favor of Skepticism, that is, to prove that there is nothing true (*Adv. log.* II 55). Hence, a self-referencing statement used by Bolzano would hardly be impressive to a skeptic, whom Bolzano wanted to convince that truths exist.

Heinrich Scholz says that there are two errors in Bolzano’s reasoning.<sup>9</sup> One is related to Russell’s type theory: Bolzano mixes levels of statements because he uses a statement about statements which belongs to a higher type. This however, does not seem to be a serious objection since propositions belonging to different types serve Bolzano’s purpose just as well.

More important is the second objection that Bolzano presupposes in this reasoning an existence of logical rules. The validity of these rules, particularly that of mathematical induction, has to be assumed to use them in deriving an infinity of other truths. This validity can be established if, in applying them, truth of premises guarantees the truth of conclusions, which appears to have a tint of circularity: the validity of rules can be established if the concept of truth is known, and a set of true propositions is created using these rules. Bolzano was aware of this problem and said that it is not required to prove that “the proof is true (or correct)”, because “the reader feels he is convinced by this proof — the more convinced, the more frequently

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<sup>9</sup> H. Scholz, *Mathesis universalis*, Basel: Schwabe, 1961, p. 241–246.



he thinks it through. He concludes from this impact, and not from a new proof, that the proof was right” (WL §33). One should not require proving validity of proofs (thus, Bolzano rules out a need for a proof theory) but a criterion of feeling of its correctness.<sup>10</sup> This, of course, leaves Bolzano’s claim open to the criticism of an unsubstantiated reliance on feeling as the criterion of validity of derivations rules. Whose feeling, though? Is the feeling of the validity of mathematical induction so overwhelming as to be always a sure guide to such a criterion? If nothing else, this problem indicates that the reliance on pure logic is not sufficient. Bolzano mentions the need of preceding the problem of discovery of truths by epistemology, but the latter is to presuppose the discussion of the theory of ideas (WL §15). There is no room for discussion of the fact that feelings are the rule correctness criterion.

Still more importantly, Bolzano in his reasoning assumes that the infinity of truths can be reached. Can we claim that an infinity of true sentences can be derived just by applying some rules? It would only be bad infinity, as Cantor calls it, if it is not completed, if it is not actual, since the infinity of truths would mean that either we assume that an infinity of truths exist and the rules allow us to connect them together with the chain of reasoning, or, if the truths are truly generated from premises, an infinite mind is needed to generate all of them.<sup>11</sup> This leads to the problem of the precedence of actual infinity over potential infinity, discussed by Gutberlet and after him, by Cantor.

An important aspect of Bolzano’s theory is his definition of truth. He says that “truth is a statement that says something about an object, which really befits it” (WL §28), or, more comprehensively, “a proposition is true when it attributes (*beylegt*) a predicate to its subject, which befits (*zukömmt*) this [subject], or, in other words, when any object that is referred to (is subordinate to, *untersteht*) the idea of the subject of the proposition [has] the attribute that is referred to by the predicate of the [proposition]” (Exner 68, 90). This appears to be very close to the classical definition of truth — *adequatio rei et intellectu*. However, the proximity to the classical definition of truth remains on the logical level, not on the epistemological level.

Bolzano discusses the concept of satisfiability (WL §147). If some ideas forming a proposition are treated as variables, then by replacing these ideas with other ideas can render the proposition satisfied or unsatisfied. A propo-

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<sup>10</sup> Cf. Gotthardt, *op. cit.*, p. 16.

<sup>11</sup> “Bolzano’s theory essentially presupposes an infinite set of truths in themselves (which is formulated in the *fundamental doctrine*) to logically found the truths that are objectively accessible to humanity”, Danek, *op. cit.*, p. 248.

sition which is always satisfied is called universally satisfiable. This bares a remarkable similarity to Tarski's definition of truth which uses the concept of satisfaction as a means of defining truth of propositions in a relational domain.<sup>12</sup> However, Tarski's theory does not really reach to the outside world, contenting itself in establishing relations between constructs of language and a relational domain through the means of metalanguage.<sup>13</sup> The same can be said about Bolzano's approach, which talks about a correspondence between a subject and predicate, but without displaying much need for breaking beyond language to see whether a corresponding relation is present in the real world. What satisfies Bolzano is that this correspondence is — although it does not exist — in the realm of truth. After all, the comparison between ideas and objects is “completely impossible”. How do we ascertain truthfulness, or rather correctness, of our subjective judgments? Bolzano is satisfied here with a few very general statements. To know the truth of the proposition “A is B”, it is enough to “perceive on a number of occasions that experiences A and B occur simultaneously”, and thus “it is never necessary to go beyond your ideas in order to ascertain the truth of your judgments” (WL §42). In this way, the problem of how our subjective ideas correspond to objects in the outside world, on the one hand, and to the concepts A and B in themselves, on the other, it is sidestepped altogether. It is certainly not sufficient to say that confirmation of a judgment is tantamount to its “forcing itself upon us, whenever we test it, i.e., whenever we turn our attention to all apparent counterarguments” (WL §43; cf. RW §62.5a). The relation between judgment and the world is just not taken into account.

### 3. Logic and theology

Very strong logical realism, or, objectivism, in Bolzano's philosophy is the result of his desire to place theology on a firm ground. Theological considerations are most important to Bolzano, which is not surprising considering the fact that Bolzano was an ordained priest, an author of, among other things, four volumes of *Religionswissenschaft* and seven volumes of *Erbauungsreden*.

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<sup>12</sup> Mourany considers Bolzano's definition of truth to be a foreshadowing Tarski's definition only in its differentiation of object language and metalanguage, Mourany, *op. cit.*, p. 56.

<sup>13</sup> See my Semantics of programming languages and the theory of truth, *Epistemologia* 16 (1993), p. 281–310.

Bolzano writes that the knowledge of God and soul is “the most important for us” (WL §44.7), that revelation is of “outmost importance” (WL §39.4) and that we should take time to find what is the “most perfect religion”, even if it takes years. However, at Bolzano’s time, Kantianism was the philosophy of the day, and in this philosophy theological problems were resolved in at least an unsatisfactory manner. In particular, the existence of God and immortality has to be assumed as postulates of practical reason since theoretical reason is incapable of giving answers in theological matters and thus unable to be a guide in the area which is of “the outmost importance”. The reason for this inability is Kantian aesthetics which does not allow for cognition of extrasensory entities, in particular, God and soul. However, such a claim is contradicted not only by “sound human reason”, but it also leads to a contradiction in Kant’s philosophy. Kant assumed that *noumena*, being beyond the reach of our senses, are the causes of the perceptive data, which is an unjustified claim since by saying this we pronounce a judgment about something which we do not know anything about (WL §62.12). Or, in another version of this contradiction, it would be already a synthetic statement to say that no statement concerning these entities could be made and that they belong to the category of extrasensory beings.<sup>14</sup>

For Bolzano, an assumption concerning the existence of *noumena* is unacceptable. The proper starting point is the statement that truth exists. But even this would be insufficient because Kant, after all, talks also about truth. For Kant, objects are always created by subject, and truth for him is always agreeing to the rules of thinking. General validity of thinking and its rules are a foundation of necessity of objects of cognition. The subject, not an object, is the foundation of truth. Objects are given only as they are formed by transcendental consciousness. However, says Bolzano, we must break with positing the subject as the starting point, with founding the truth on the subject, and set the truth on its own feet, independently on the subject, whereby it would be purified of subjectivity and possible dependency on a subject’s cognitive powers, on the subject’s will, and on the subject’s emotions. Therefore, we should begin with a “thorough study of logic” (RW §63.3) and treat the subject of logic as independent of the process of cognition.

The major innovation of Kantian philosophy was the role of subject in constructing the object of cognition. This was unacceptable to Bolzano who insisted that in the act of cognition an object is not constructed, but grasped, in which he is closer to Aristotle than Kant. The analysis of cognition should

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<sup>14</sup> B. Bolzano, *Athanasia*, Sulzbach: Seidel, 1838, p. 17.

start with the sphere outside the subject, but not with just any sphere — say, with matter — but with the realm of truth. Starting with the objective is by no means Bolzano’s innovation. For example, this is also an approach found in Thomas, who begins both his *Summae* with the objective, with God, and then proceeds to the analyses of man and his cognitive apparatus. What is new in Bolzano is placing the realm of truth in an objective sphere independent of any subject, even that of God’s. This entails dualism permeating Bolzano’s philosophy. Except for real things, there are also other things that are merely possible, e.g., truths in themselves. Bolzano says he would like to know “from what higher unity can we derive these two” kinds of things (WL §453). This is a rhetorical question since these two kinds of beings, logical and real, cannot be reduced to one foundation. Not even the concept of God can be used here since truths are outside God.

This all can be considered an expression of Platonism in Bolzano’s thought — Bolzano sees in Plato one of his predecessors (WL §51) — and the presence of a strong Platonist undercurrent in his logic is frequently recognized.<sup>15</sup> There was also a mention of a mystical component in Bolzano’s thought and that for him, as for Plato and Leibniz, was the “sky full of stars of truth even in places where no spiritual eye can gaze them”<sup>16</sup>. This is true for Leibniz whose monads have all the knowledge which is activated from within since these monads are “without doors and windows”. In Plato, the knowledge of the world of ideas is activated by the external world, causing the subject to remember ideas seen before. The monad has a built-in knowledge when coming to this world; Plato’s subject acquired this knowledge when visiting the world of ideas. But it is not clear how any knowledge comes to Bolzano’s subject. So, at best, Bolzano’s Platonist strain can be defended on the ground that the truths are objective, independent of the subject. And so it is in Plato and in Leibniz. However, the truths do not exist in Bolzano’s theory<sup>17</sup>; for Plato, they are very real, they are more real, as a matter of fact, than the reality of our world.

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<sup>15</sup> Cf. Joseph Gotthardt, *Das Wahrheitsproblem in dem philosophischen Lebenswerk Bernard Bolzanos*, Münster: Westfälische Wilhelmsuniversität, 1918, p. 83–85; Fred Pfeiffer, *Bolzanos Logik und das Transzendenzproblem*, Zürich: H. Beyer, 1922, pp. 240, 250.

<sup>16</sup> Melchior Palágyi, *Kant und Bolzano, eine kritische Parallele*, Halle: Niemayer, 1902, p. 19.

<sup>17</sup> Bauer’s claim that for Bolzano truths in themselves obtain “its true existence through an act of creation” directly violates Bolzano’s explicit statements concerning these truths, Roger Bauer, *Der Idealismus und seine Gegner in Österreich*, Heidelberg: Winter, 1966, p. 54.

In this separation of ideal content of true cognition from psychological activities is Bolzano a forerunner of Husserl who sees in his phenomenology a foundation of psychology. Phenomenology is not interested, like psychology, in facts and realities, but in essences, and through eidetic reduction, phenomenology abstracts from all these realities. The essence in its irreality is separated from empirical contingencies, from spatiotemporal accidents. Intuition of essences is independent of intuition of individuals; it is pure intuition. After following Bolzano in *Prolegomena*, Husserl comes to the question: how is it that the object in itself can be known, can be grasped; what is the meaning of the statement that an object in itself can present itself in the act of cognition<sup>18</sup>? This question is an implicit criticism of Bolzano.

However, in the light of the importance of theological matters in Bolzano's thought, it is important to see also theological consequences of his logic, or rather, his ontology of logic.

First of all, the independence of the realm of truth: "a proposition in itself ... exists neither in a certain place, which is the case only for substance, nor in a certain time, which would be the case for a thought; [it is] neither a creation nor finally even God himself or in God since there is in him only a thought about it, but not [the proposition] itself."<sup>19</sup> If propositions were in God's mind, they would have to follow his principles, but not their own. The existence of the world depends on God, but its existence is due to God's creative power and not his cognitive power (*Vorstellungskraft*). God's cognitive power seems to be constrained by the realm of truth since a proposition in itself is not true because God thinks about it as true, but God thinks about it as true because it is true. (The same, by the way, holds for ethical norms, RW §90.11.) Therefore, God's transcendence hinges upon transcendence of the realm of truth. Thus, if Bolzano says that "it is impossible that God can err" (RW §39.3), he pronounces the existence of God's attribute which would be vacuous if it were not for the realm of truth.

Bolzano does not justify why truths are independent of God except for making a passing remark that the idea of truths being first thought by God appears to him absurd. The reason is that the same status should also be ascribed to false propositions, that is, if true propositions exist in the mind of God, then so do false propositions, "which seems to be even more

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<sup>18</sup> Edmund Husserl, *Logical investigations*, London: Routledge & Kegan Paul, 1970, v. 1, p. 251.

<sup>19</sup> Letter to Romang, 1 May 1847, in Eduard Winter, *Religion und Offenbarung in der Religionsphilosophie Bernard Bolzanos*, Breslau: Müller & Seiffert 1932, p. 30.

striking nonsense” (Exner 80). In another place, however, Bolzano admits the existence of false propositions in “God’s infinite understanding”, but not “as judgments, but merely as ideas of objects about which he judges” (WL §34.3). This may be defended by saying that if false propositions were also God’s creations, then God would be guilty of the existence of a falsehood. However, because the realm of false propositions in themselves is independent of God, he may see them as false, but he is not the cause of their existence, which is an expression of a mild form of Manicheism.

Proposition in itself is neither Plato’s idea, nor God’s thought, nor a category of intellect. It is not grounded on any eternal being; it is “an objective content grounded only on itself”<sup>20</sup>. The sphere of truth would exist even in the event of nonexistence of God. God did not create it, nor has any influence on it; he is able to know all truths at the same time, but he knows them because he is omniscient, not because he created them. It is evident that this conception undermines God’s transcendence.

Truths in themselves not only are objective, thus independent of any subject, but they also enable cognition: there would not be any mental proposition if there were no propositions in themselves (WL §22), or, more specifically, “if there were no truths in themselves then there could not be any recognized (*erkannt*) or thought truths” (Exner 9). This is a theologically potent statement if we consider the fact that, for Bolzano, people have a natural drive for truth (RW §18.5). If objective truths did not exist, then our desire to know the truth could not be realized. People, however, are created by God — an obvious fact to Bolzano — and if he implanted in them this drive, it was done because of the existence of objective truths. God would not create in us a drive that cannot be realized — his perfection and goodness would prevent him from doing this. Creating a drive for truth was determined by the existence of the realm of objective truth, a realm independent of God; thus, at least at this one point, God’s act of creation was determined by something surpassing him. Moreover, when assessing a revelation, we have to know whether it is true to follow it, which is dictated by the “obligation of truthfulness” (RW §39.7). This elevates the realm of truth to the highest status, and it almost appears that God is needed here to be a material cause of this rule in us, whereas the realm of truth is the formal cause.

With respect to his objective truths, Bolzano sides with Leibniz, to whom “the truth of laws and ideas did not depend on the will of God, as Poiret,

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<sup>20</sup> Waldschmitt, *op. cit.*, p. 13.

Buddeus, and others maintained". We can also include here Descartes, according to whom God created everything, including truths, since he is an absolutely transcendent and free being. Truths have no inner necessity, so that even the validity of the law of contradiction depends on God's will, thus God can make two contradictory statements true.<sup>21</sup> However, Bolzano cannot accept it when Leibniz "adds that necessary truths depend only on his reason.  $2 \times 2 = 4$  not because God thinks it, but God thinks it, because  $2 \times 2 = 4$ "<sup>22</sup>. Also, Bolzano objects to Leibniz's siding with Jacob Thomassius, who said that "it is not advisable to go altogether beyond God, and one must not say with some Scotists, that the eternal verities would exist even though there were no understanding, not even that of God" (*Theodicy* §184).

There is a cleavage in Bolzano's theory between the subjective and the objective. Logically, this is the strongest point of his approach, philosophically, the weakest. Bolzano does not solve the problem why objective objects, objects in themselves, can be known. His objectivism distances itself even from analysis of validity of subjective cognition. In his battle against one-sidedness of subjectivism and psychologism, Bolzano fell into one-sidedness of objectivism by concentrating on the objectivity of truth, on its being truth in itself, and overlooking the fact that it should also be truth for us, known to us, and used by us.<sup>23</sup> So Bolzano stops half way by distancing himself from psychologism in metaphysics, but he did not account for the epistemology of human subjects who, after all, use their mental abilities to acquire knowledge and to test this knowledge for its validity. In that respect neo-Kantianism and phenomenology made the second step by also including in their analyses the epistemological problem, how do we know what we know. However, maybe because of his preoccupation with an objectivist solution of Kantian problems, Bolzano was able to create his vast and impressive logical edifice which, from the standpoint of today's logic, is much more important than his metaphysics. His emphasis placed on truths in themselves very rigidly separated judgments from objective propositions, that is, the sphere of psychology from the sphere of logic. This separation was necessary for further progress of logic. And probably the weakest part

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<sup>21</sup> Letter to Mersenne, 27 May 1630, *Oeuvres*, Paris: Cerf, 1897–1913, v. 1, p. 151–152; letter to Mersenne, 2 May 1644, v. 4, p. 118.

<sup>22</sup> Bolzano, *Verschiedenheit zwischen Leibnizens und meinen Aussichten*, in Eduard Winter, *Leben und geistige Entwicklung des Sozialethikers und Mathematikers B. Bolzanos*, Halle: Niemeyer, 1949, p. 77.

<sup>23</sup> The concept of proposition in itself is "an Icarus' attempt ... to free human thinking not only from the bonds of language, but also from human psyche" Pelágyi, *op. cit.*, p. 34.

of his discussions, the ontology of objective ideas and propositions, is simply unimportant for logic itself; thus, logic was not halted by convincing philosophical resolves offered by Bolzano, or, for that matter, by any philosopher. Bolzano's solutions, however, have very important consequences for theology, which for Bolzano was of primary importance. Unfortunately, Bolzano did not succeed in offering an ontology of logic which could be fully acceptable from the point of view of theology.

ADAM DROZDEK  
Duquesne University  
Pittsburgh, PA 15282, USA  
e-mail: [drozdek@duq3.cc.duq.edu](mailto:drozdek@duq3.cc.duq.edu)