Art, knowledge and induction

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Abstract The aim of this paper is to try to show some connections between Goodman's paradox of induction and Goodman's theory on aesthetics. This will be attempted also by means of the reference to Hempel's paradox. Goodman's point of view on induction takes as very relevant the notion of "entrenchment" while his conception of art gives a parallel importance to the whole context where we are required to express our evaluation of the meaning of the work of art, where the notion of "habits" seems to be involved in a very relevant manner. In both the cases, Goodman's reflexion is related to his nominalism, but his strategy in the analysis of induction seems exposed to some objections, that we try to examine by relying on the notion of nonmonotonic reasoning, that we use also in the inquire about Hempel's paradox. On this ground, we present some remarks on some of the main points of Goodman's aesthetics.

Keywords: languages of art, paradoxes of induction, art and science, nonmonotonic reasoning, entrenchment

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1. The languages of art

An important problem in the tradition of analytic philosophy is that of the relation between arts and rationality (HANDJARAS 2005). Some compelling questions arise in this perspective: is it possible to elucidate the relation between arts and science? Is there a specific content that arts can bring in the cognitive dimension? What is the meaning that arts can have in connection with the domain of emotions?

Nelson Goodman, in *The languages of arts* $(1969)^1$, has tried to respond to these questions, by adopting the theoretical strategy of developing a systematic analysis of the functioning of symbols. The rationale of this approach is that both arts and sciences are related to the use of symbols, thus the attempt to give a sketch of a «general theory» (*ivi*: 11) to explain this notion can offer a set of clues to derive a better comprehension of the issues connected to our initial questions.

The idea of Goodman is that we cannot give a complete definition of the characters that are specific of the aestethic, but we can arrive to establish a list of its "symptoms": «A symptom is neither a necessary nor a sufficient condition for, but

¹ And in GOODMAN (1972, 1978a, 1984) and GOODMAN, ELGIN (1988).

merely tends in conjuction with other such symptoms to be in, aesthetic experience» (*Ivi*: 252). The five symptoms that Goodman (1978a) retains to have detected are: syntactic density, semantic density, relative repleteness, exemplification, multiple and complex reference:

- 1. syntactic density, where the finest differences in certain respects constitute a difference between symbols for example, an undergraduated mercury thermometer as contrasted with an electronic digital-read-out instrument.
- 2. Semantic density, where symbols are provided for things distinguished by the finest differences in certain respects for example, not only the undergraduated thermometer again but also ordinary English, though it is not syntactically dense.
- 3. Relative repleteness, where comparatively many aspects of a symbol are significant for example, a single-line drawing of a mountain by Hokusai where every feature of shape, line, thickness, etc. counts, in contrast with perhaps the same line as a chart of daily stockmarket averages, where all that counts is the height of the line above the base.
- 4. Exemplification, where a symbol, whether or not it denotes, symbolizes by serving as a sample of properties it literally or metaphorically possesses.
- 5. Multiple and complex reference, where a symbol performs several integrated and interacting referential functions, some direct and some mediated through other symbols (GOODMAN 1978a: 67-68), see also Goodman (1969: 252-5), where multiple and complex reference is not mentioned.

Notice that «exemplification, like denotation, relates a symbol to a referent, and the distance from a symbol to what applies to or is exemplified by it is no less than the distance to what it applies to or denotes» (GOODMAN 1969: 252).

In order to suggest an answer to the question of the connections between arts, emotions, knowledge and science, Goodman develops his point of view by sustaining that «aesthetic experience is cognitive experience distinguished by the dominance of certain symbolic characteristics and judged by standards of cognitive efficacy» (*Ivi*: 262). For Goodman «[d]espite rife doctrine, truth by itself matters very little in science» (*Ibidem*):

Given any assemblage of evidence, countless alternative hypotheses conform to it. We cannot choose among them on grounds of truth; for we have no direct access to their truth. Rather, we judge them by such features as their simplicity and strenght (*Ivi*: 263).

The distance between arts and science is so much reduced (BOEDDU 2007): «arts must be taken no less seriously than the sciences as modes of discovery, creation and enlargement of knowledge in the broad sense of advancement of understanding» (GOODMAN 1978b: 102). It is interesting that when Goodman's *Ways of Worldmaking* (the book from which the last quotation is taken) was published, there was a review by W.V.O. Quine (1978), who was critical against the form of relativism vindicated by Goodman and the consequent conception of the role of arts in knowedge, that he saw as dangerous and not capable of catching the specific cognitive meaning of science (VARZI 2008). Goodman's response to Quine's review is relevant in this context also because its author explicitly underlines that his book, *Ways of Worldmaking*, requires to be read on the background of his previous works, *The Structure of Appearance* (1951), *Problems and Projects* (1972), *Languages of Art* (1968), *Fact, Fiction, and Forecast* (1979, 1st edition 1954).

The last work is particularly significant in order to be able to develop the argument

that we wish to propose in this paper. We must pay attention to the fact that a part of the theoretical assumptions that are presupposed to Goodman's theory of art was been expressed more explicitly in *Fact, Fiction, and Forecast.* We can attempt to illustrate the reason. In all his writings, Goodman holds a *nominalistic* approach in the inquire about symbols (SHOTTENKIRK 2009). Goodman's nominalism amounts to the «refusal to recognize more than one entity comprised of exactly the same basic elements» (ELGIN 2001: 679), but «[t]his says nothing about the metaphysical constitution of the elements» (*Ibidem*). While «[s]et theory admits infinitely many distinct entities – sets of sets of sets... – all composed of the same basic elements» (*Ibidem*), instead «[m]ereology holds that the same basic elements are parts of but a single whole» (*Ibidem*), according with a framework that Goodman had proposed in *The Structure of Appearance* (GOODMAN 1951)².

Starting with this kind of theoretical premises, he arrives to sustain that the difference between icons and symbols is not intrinsic (BENNETT 1974): «for Goodman there is not break of continuity between exemplification, pictorial representation and linguistic description» (VARZI 2008: 5). In Goodman's view,

[r]ealism is relative, determined by the system of representation standard for a given culture or person at a given time [...] For a Fifth-Dinasty Egyptian the straightforward way of representing something is not the same as for an eighteenth-century Japanese (*Ivi*: 37).

«Realistic representation, in brief, depends not upon imitation [...] but upon inculcation. Almost any picture may represent almost anything» (*Ivi*: 38).

2. The "grue" predicate

In this section, we shall turn our attention to the well-known "grue paradox" (GOODMAN 1979, STALKER 1994, GKOGKAS 2008: 92 ff.): we shall see the relevance that in the whole construction of Goodman must be assigned to this paradox, that is a fundamental tool that Goodman employs to vindicate his nominalism. The relation between the meaning of the paradox – usually discussed in works about epistemology – and the aesthetics' problems we were handling, lies in the relation with Goodman's nominalism that both share.

Goodman's reasoning is the following:

That a given piece of copper conducts electricity increases the credibility of statements asserting that other pieces of copper conduct electricity [...] But the fact that a given man now in this room is a third son does not increase the credibility of statements asserting that other men now in this room are third sons (GOODMAN 1979: 73).

In some cases a certain hypothesis is lawlike, in some other not, but we «must look for a way of distinguishing lawlike from accidental statements» (*Ibidem*).

By means of a short exposition of the paradox, we can show the problems that underlie this only apparently easy to solve difficulty. Goodman introduces the predicate "grue", that

² Following the basic lines sketched in GOODMAN, LEONARD (1940). See also HANDJARAS (1991: 45-52), KOHNITZ, ROSSBERG (2014: 76 ff.).

applies to all things examined before t just in case they are green but to other things just in case they are blue. Then at time t we have, for each evidence statement asserting that a given emerald is green, a parallel evidence statement asserting that that emerald is grue [... therefore] the prediction that all emeralds subsequently examined will be green and the prediction that all will be grue are alike confirmed by evidence statements describing the same observations (GOODMAN 1979: 74).

There is some room to interpret the "grue" predicate in different manners, for example: "green if examined before future time t or blue if examined afterwards", or "green if examined before t and blue if examined afterwards", or "green and examined before t or blue and examined afterwards" (where "if", "and", "or", can be taken as the informal translation of material implication, conjunction and exclusive disjunction, in agreement with well known stipulations of formal logic). In any case, one could object that the predicates "green" and "blue" are primitive, while "grue" is not, but Goodman claims that primitiveness «is not a theory-neutral characteristic of predicates» (*Ivi*: 688), namely we can consider primitive the predicates "bleen" and "grue" rather than "green" and "blue", where "bleen" means "blue if seen before t or green if seen at t or afterwards"³.

The proposal that now we wish to present relies on the following reasoning:

1) The "grue" paradox arises only if we conceive induction as a monotonic form of inference. Namely, if we accept that induction is a form of *nonmonotonic* reasoning, we can see that the paradox vanishes. Fitelson (2006) describes Hempel's and Goodman's definition of confirmation as involving the property of monotonicity: (M): If *E* confirms *H*, then *E X* confirms *H*, for any *X* (*Ivi*: 98). Fitelson's argument is that Goodman's and Hempel's

theory of confirmation implies (M). To see why, note that Hempel and Goodman explicate "*E* confirms *H* relative to *K*" as "*E* · *K* entails *Z*", where *Z* is a proposition obtained from the syntax of *H* and *E* in a certain complex way, which Hempel (1943, 1945) specifies (the technical details of Hempel's theory of confirmation won't mater for present purposes). Of course, if *E* by itself (i.e. $E \cdot \mathbf{T}$ for tautological **T**), entails *Z*, then so does $E \cdot X$, for any X. As a result, in Hempel's confirmation theory, "*E* confirms *H*, relative to K_{T} " implies "*E* · X confirms *H*, relative to K_{T} ", for any proposition X. Thus, Hempel's theory implies (M) (*Ivi*: 98-99).

Goodman and Hempel, according to Fitelson, miss to ackowledge this point. Here we can accept such a view (in the following pages some reasons to defend it will be presented), but we do not refer to a Bayesian theory of induction (as it is in Fitelson's approach)⁴;

³ With regard to this subject, it would be useful to dwell on the notion of "simplicity". Here we can only recall GOODMAN (1972: 275 ff.), HANDJARAS (1983).

⁴ The theoretical strategy that we adopt on this point was exposed in my DI PROSPERO (2003) with reference to Hempel's paradox. In relation to the attempt of comparing inductive and deductive logics, see for example SALMON (1969), WILLIAMSON (2017). The idea that induction could be vindicated only by means of a sort of reduction of it to a deductive form of inference – and the consequent refusal of induction – in different ways is present in POPPER (1969), FEYERABEND (1968). A general discussion about the philosophical meaning of nonmonotonic reasoning can be found in CEL-LUCCI (1998).

2) Given that this point concerning the consequences of nonmonotonicity of induction, is particularly important, we shall try to show some reasons useful to establish it by means of the reference also to Hempel's paradox: the scheme of solution, we believe, is basically the same in both the paradoxes;

3) As an effect of this argument, we shall see that Goodman's general conception of induction – and his answer to the paradox – is somewhat confirmed, even if we find this outcome – paradoxically – by using a framework that is exactly the opposite of Goodman's, *i.e.* by substituting his (implicitly monotonic) description of induction with a nonmonotonic one;

4) The extreme form of nominalism that Goodman defends in all his works, turns – we can say, rather surprisingly – into a rather different position. My attempt will be to show that – if we choose to adopt Goodman's nominalism – we can arrive at his particular view on induction, but – if we start with a different conception of induction, *i.e.* a nonmonotonic one – we can conclude with a point of view concerning issues that are very important in Goodman's reflections (for example, about relativism), and that *converges* with Goodman's, but at the same time we are able to avoid some problematical passages of his philosophy.

The basic line of the reading of Goodman's works that we adopt can be found in Handjaras:

it is possible to move from a critical reflection about some clear signs of crisis of a classical conception of rationality, without renouncing to a rational commitment, but rather redefining it in constructive terms (HANDJARAS 1991: 8).

so that we can refuse to allow a form of "irresponsible relativism" (GOODMAN 1988: 166, MARCHETTI 2006, COHNITZ, ROSSBERG 2014, DE DONATO-RODRIGUEZ 2009).

The main ground of our proposal lies in the fact that - likely - we must consider induction as a form of *nonmonotonic* reasoning. If an inference is nonmonotonic, we must accept the possibility that in case we add new premises to the first ones, we can obtain a conclusion that *contradicts* the former ones (notice that if it we work within a probabilistic framework, in intuitive terms, the new evidence must compel us to change the first degree of probability that formerly we have assigned).

The non-monotonicity of uncertain [abductive or inductive] inferences makes it possible that "P1,..., // C" is correct [where the double forward slash "//" means that there is a "correct" inference], but "Q, P1,..., Pn //C" is incorrect for some (true) premise Q, where Q typically expresses "exceptional information." For example, "1000 swans have been observed to be white // Therefore probably: All swans are white" is a correct inductive generalization, but the premise-expanded inference "1000 swans have been observed to be white and 10 to be black // Therefore probably: All swans are white" is inductively incorrect (SCHURZ 2014: 58).

A type of monotonic inference is the Aristotelian syllogism: if we add new pieces of information to those expressed by the major and the minor premises, we can be sure that – if the new premises are not in logical contradiction with the former ones – the previous conclusion *cannot* be contradicted by the last ones. It is different in inductive reasoning, where we have a kind of inference that can lead to some conclusions – starting with a set of premises S – and all the same, if we add a new set

of premises S', even if S' does not contradicts S, it can lead to different conclusions that contradict the former ones.

We cannot specify exactly the formal properties of the inductive inference in all its aspects: such a task is very far to be accomplished by the present works in logics and philosophy of science. But we can say very reasonably:

- 1) That the inductive inference does not respect the requirement of monotonicity.
- 2) That the nonmonotonic character of inductive reasoning actually shows that the human thinking (in the degree that it is conditioned by the features of inductive inference) is strictly related to the context of knowledge that is available to a specific subject.

My purpose, then, is to show that Goodman's conception of induction on the one hand depends strongly on his paradox, that relies on a way of conceiving induction that is monotonic, on the other one – just by means of the paradox – arrives to conclusions that are specular to those we obtain here directly by means of a nonmonotonic definition of induction⁵. In fact Goodman's view on induction leads him to a form of relativism and "irrealism" (CHIODO 2006).

- i) Relativism, because we are, for Goodman, "worldmakers": «We make a star as we make a constellation, by putting its parts together and marking off its boudaries [...] The worldmaking mainly in question here is making not with hands but with minds, or rather with languages or other symbol systems» (GOODMAN 1984: 42). With reference to the paradox, in *Fact, fiction, and forecast*, Goodman holds that inductive inferences that are "lawlike", namely those that we can trustly accept, rely on predicates that are "well-entrenchered", *i.e.* on the terms that our own *habits* tell us that we must employ substantially in the same way as a "realistic" picture we have seen is a picture that conforms in such and such ways to our habits. The point is that our judgements about resemblance rely upon our previous experiences, upon our artistical formation and all our experiences concerning the aesthetical.
- ii) Irrealistic, because «reality in a world, like realism in a picture, is largely a matter of habit» (*Ivi*: 20), even if it is firmly maintained the point for which «[t]hat right versions and actual worlds are many does not obliterate the distinction between right and wrong versions» (*Ibidem*): «we do not welcome molecules or concreta as elements of our everyday world, or combine tomatoes and triangles and typewriters and tyrants and tornadoes into a single kind» (*Ibidem*).

In intuitive terms, it seems that Goodman's account of induction, particularly by means of the notion of entrenchment (and "habits"), presupposes in an obvious sense the use of some kind of inductive inference. Namely, the answer he gives to his paradox would be a sort of begging the question⁶. If we wish to try to transpose these remarks to his theory of arts, we should find for them a formulation able to take into account the very sophisticated analysis of Goodman. This seems not impossible. We could say something as: «we can judge about the resemblances between two different artistic styles, only if there are "real" facets that are shared, so the same question is posed again, etc.». In Goodman's works we could find very articulated and complex answers to these questions, that perhaps can appear satisfying. Nonetheless, probably the two issues (in epistemology and in aesthetics) are so strictly related that it seems

⁵ For the contextualistic meaning of Goodman's approach, SEIDE (2009).

⁶ About the concept of "reflexive equilibrium", see *e.g.* DE CARVALHO (2013).

preferable to try to face with the second only after having dealt with the first one (while – notice – it seems at least in some degree easier to dwell on the first without a specific concern for the second one): the net of links between the two topics is very complex, and likely it is impossible to give an evaluation of the theory of symbols in the *Languages of Art* without firstly a clear definition of the results of the inquire conducted in *Fact Fiction, and Forecast*. Arguments concerning art are largely independent from those about induction, but both of them are deeply rooted in the common ground of nominalism, thus relevant objections against it (such that we can obtain by reflecting on the paradox) can yield interesting consequences also on Goodman's aesthetics.

3. Hempel's and Goodman's paradoxes

We can begin our reflections at this regard by referring to a problem, Hempel's paradox (HEMPEL 1945), that is often treated altogether with the "grue emeralds" issue. The premise is that if we wish to define the logical form of inductive inference, we can provide (in rough terms) a quite simple description, that Hempel (1945: 10) calls "Nicod's criterion" (NC), from the name of the scholar, Jean Nicod, who has formulated it. If the hypothesis is (i) "All ravens are black", for (NC) we have that (i) is confirmed by observing any object that is both a raven and black, and if there are no other kinds of things that might be confirming instances: if we find a raven that is not black, this should be considered an instance falsifying (i), while observing objects that are not ravens (that can be either black or non-black) should be considered irrelevant in regard to the inductive confirmation of (i). At this point, Hempel introduces the "equivalence condition" (EC): «Whatever confirms (disconfirms) one of two equivalent sentences, also confirms (disconfirms) the other» (*Ivi*: 12). Even if both (NC) and (CE) seem to be clear and simple enough, in reality the result of their contemporary acceptance produces a paradox:

if *a* is both a raven and black, then *a* certainly confirms *S1*: "(*x*) (Raven (*x*) \rightarrow Black (*x*))", and if *d* is neither black nor a raven, *d* certainly confirms *S2*: "(*x*) (~Black (*x*) \rightarrow ~Raven (*x*))."

Let us now combine this simple stipulation with the equivalence condition: Since S1 and S2 are equivalent, d is confirming also for S1; and thus, we have to recognize as confirming for S1 any object which is neither black nor a raven. Consequently, any red pencil, any green leaf, and yellow cow, etc., becomes confirming evidence for the hypothesis that all ravens are black (*Ivi*: 14).

The conclusion seems to be that the definition itself of the general form of inductive inference appears to be impossible, given that also the observation (e.g.) of a red pencil should confirm the hypothesis that all ravens are black.

A point that we need to examine concerns the exact definition of the set of premises that constitute the initial evidence. What are the actual premises of the paradoxical inference? We could answer:

1) "*a* is a green leaf" or,

2) "*a* is not black and it is not a raven".

Hempel seems to hold that these two possibilities are interchangeable: we know that it is the case that (1) is true, thus we can deduce (2); namely, if we start from (2), the paradox is immediate, while if we start from (1) we only need one further passage to deduce it.

In the formulation of the paradox that I have reported above, it is written exactly that «any red pencil, any green leaf, and yellow cow, etc., becomes confirming evidence for the hypothesis that all ravens are black». Literally, this formulation entails that we know that a, e.g., is a "red pencil", thus it is correct to accept that for Hempel both (1) and (2) are cases capable of bringing forth the paradox. It seems that the distinction between the two cases is not considered relevant here, simply because it is implicitly accepted that, if we know that a is a red pencil, we can easily *deduce* that a is not black and it is not a raven. According to this view, the original information is in effect larger (*i.e.* we know that the object which has been observed is a red pencil), but it is taken for granted that afterwards it can be "split", without falling into fallacies, by considering only (e.g.) "a is not a raven and a is not black", given that this proposition is perfectly deducible from "a is a red pencil". Hempel and Goodman seem to accept such a way of reasoning, and this should entail that they consider induction as a form of reasoning that involves monotonicity. My objection is that there are good reasons for abandoning this presupposition, given that inductive reasoning certainly cannot be seen as a monotonic form of reasoning (MUSGRAVE 2011). The concept itself of "methodological fiction" proposed by Hempel (1945) relies on underlying intuitions that relate directly with this point.

In order to offer a quite obvious example, we can observe that it is clear that if we see the moon over several months, we shall be able to discover the law describing its phases and their succession. If we take these data in their totality, of course they entail that the moon at one instant t was in its full phase, but it would be absurd to employ only this last section of our total information to hold that "The moon is always full" – even if in effect that particular section of the whole information is logically deducible from the data.

Both Goodman and Hempel draw their paradoxes making reference to Hempel's attempt to offer a "purely syntactical definition of confirmation" (HEMPEL 1943, 1945). Harold Brown describes Hempel's theoretical framework in these terms:

the paradigm on which Hempel is attempting to model his logic of confirmation is the deductive logic of *Principia Mathematica*. But it is a general principle of *deductive* logic that if a given set of premises entails a particular statement, then the addition of further statements to the premises set cannot affect this entailment relation. I submit that it is because he is attepting to analyze the confirmation relation with an eye to the deductive paradigm that Hempel assumes that if an hypothesis is confirmed by a given observation statement, the addition of further observation statements cannot negate that confirmation relation (BROWN 1977: 32).

Brown presents such remarks with reference to Hempel's concept of methodological fiction, but clearly they can be applied also in the context of our own argument (the same points are dealt with in a particular clear guise by Abrusci 1997 and Fitelson and Hawthorne 2010).

If we accept that such an insight about confirmation can be legitimately rebutted, assuming that induction is radically different from deduction also on the specific aspects that we consider, we can return again to the example of the ravens, and see that the information that *a* is not black and it is not a raven, confirms the proposition "Any thing which is not black, is not a raven", that is equivalent (by contraposition) to the hypothesis (i). But the observation of a green leaf confirms (*if* we take into account the entire information that it gives us) "All green-things are leaves", which does not entail at all the hypothesis (i) that "All ravens are black". The point is that we must state that we have to employ *all* and *only* the information which is contained in the premises. We can present this view in other terms that may be useful to render my reasoning clearer. We can say that to observe an object which is a green leaf, allows us to infer that it is not black and it is not a raven, but we can also infer on it a great number of other properties: on the one hand that it is neither red, nor yellow, nor white, etc., on the other, that it is neither a table, nor a glass, nor a sheet of paper, etc. If we allow (following Hempel) the reference to the first part of this information ("*a* is not black and it is not a raven"), we cannot give any reason for excluding possible reference to the other parts of the information. In a previous paper, I have tried to develop these remarks by means of the notice that we can see that observing a green leaf confirms (if we accept that by means of the proper assumptions we can take for granted that if one object is for example a raven, it cannot also be a table, or a glass, etc.):

(x) (Green (x) & ~Black (x) & ~Red (x) & ~Yellow (x) & ... \rightarrow Leaf (x) & ~Raven (x) & ~Table (x) & ~Glass (x) & ...)⁷.

But subsequently

By contraposition we obtain:

(x) (~(Leaf (x) & ~Raven (x) & ...) \rightarrow ~(Green (x) & ~Black (x) & ...)).

At this point, if we draw an elementary inference by relying on one of De Morgan's laws, we obtain:

(x) (~Leaf (x) v Raven (x) v ... \rightarrow ~Green (x) v Black (x) v ...).

Actually, this proposition only states: "If x is a raven or a table or a glass or whatever other thing, apart from it being a leaf, then x will be black or red or yellow etc, but it cannot be green" (DI PROSPERO 2003: 129).

At this point it is necessary that we examine more in detail the theoretical assumptions that are needed to make my proposal of analysis acceptable. The debate on induction often makes reference to the "principle of total evidence" (CARNAP 1947): if we wish to obtain inductive generalizations that are not only formally correct, but that are also intuitively plausible, we need to use all the information that is available (and that might appear relevant in order to modify the outcome of the inference). In Hempel's terms, such a principle is not a «rule of inductive inference» – rather it is a «rule of application» which is «rational» to apply to inductive reasoning (HEMPEL 1966: 178).

⁷ Of course it is more correct to say that what is confirmed is the equivalence (and not only the simple entailment), but this is not relevant in relation to the argument presented here. To what I know, only FITELSON and HAWTHORNE (2010), FITELSON (2006, 2008, see also FITELSON 2005), deal with the paradox relying on the concept of nonmonotonicity of induction in a manner that is (at least under some aspects) similar to mine (FITELSON, HAWTHORNE 2010: 208-209). They emphasize that in the studies about the paradoxes that they know, such a kind of approach is not present. Even if there are very relevant differences (especially because I think it is not strictly necessary to adopt a Bayesian framework to obtain the resolution of the paradox can work), in any case I exposed my strategy of analysis in DI PROSPERO (2003).

In my argumentation, I actually only use a premise that is different (and weaker): we can choose to ignore the question of whether the outcome of an inference is *plausible*, but it is necessary in any case to specify the sentences that we have to consider as premises (both those expressing the initial evidence and those defining the "logical grammar" of the meanings of the words, *e.g.* saying that by definition a "raven" cannot be a "tree", etc.). The conclusions that are obtained must refer to the whole set of these sentences, and to them only. If the set of premises is modified, we simply end up dealing with a different inference, namely with an inference which is different from the original one. This theoretical premise seems to be appropriate particularly in the case we wish to provide a "purely syntactical" definition of confirmation, as Hempel (1943) asserts.

One particular problem is that in any inference we make a selection of data: even if most of the information is always (obviously) ignored, nevertheless we believe that the conclusion will be reliable. Basically, the nonmonotonic character of induction must lead us to deny this expectation: whenever somebody makes an inductive inference, the largest context of information which is accessible, is always the one to be preferred, as it is stated by the principle of total evidence. Nevertheless, in most of the cases the usual strategy suffices. The problems that might arise concern particularly the definition of criteria by which the premises that should be taken into account could be specified, and this is the question that is the core of Goodman's analysis of induction (GOODMAN 1979).

What are, thus, the consequences that we can derive for the inquire concerning Goodman's paradox? We can try to examine whether the reference to the nonmonotonic character of inductive inference does entail some implications for the grue paradox too. The definition of "grue" involves the employment of two conditionals:

1) if x is seen before t, then x is green,

2) if x is seen afterwards, then it is blue (we can use this definition – where (1) and (2) can be related by a conjunction or by a disjunction – while if one wishes to adopt one different analysis of "grue" among those considered above, only little modifications are to be be required to consent our strategy can work).

A sentence that has the form of the material implication is true: i) if it is true the consequent or ii) if both the antecedent and the consequent are false. This means that by (the whole and exact content of) this predicate we express a piece of information that likely is impossible to find in the real world, given that the *exact* information expressed by a material implication cannot be seen as referred to a kind of property that we can observe in the world, and surely - in any case - it is not applicable (to exactly the whole and only the thing that we see) when we see a "green emerald". In other words, we see an emerald and so we gather a certain content of information (C): for example that it is a stone, that it is green, etc. Then, we substract a part of this information, and we choose to refer only to a section of it, namely that one that we find expressed in the two conditionals forming the definition of the grue predicate. But we should consider illecite such a substraction of information - if we wish to use such a predicate in an inductive inference – because this would violate the constraints that the inductive inference – for its nonmonotonicity – must satisfy. Also if we consider "grue" and "bleen" as primitive predicates, considering that «nothing is primitive or is derivationally prior to anything apart from a constructional system» (GOODMAN 1978a: 12), we need to respect the requirement that the entire and only the piece of information that we - for hypothesis - accept as checked on, should be assumed as premise of the inference – otherwise the arising of the paradox must be explicated in terms of a mistake committed when we have choosen the premises, and not afterwards, when we have effected the inference. Goodman maintains that, for example,

[t]he size and shape of the moon vary, it seems, according to the speed and direction of its motion. Thus since motion is a matter of convention [given that it «depends upon what we take as frame of reference»] so are size and shape [...] All fact threatens to evaporate into convention, all nature into artifice (GOODMAN 1988: 94-95)

but of course such a kind of argument in favor of conventionalism does not involve that we actually look at the sky and see the moon – at one singular moment – with more than one shape and size, thus, at each moment, the nonmonotonic character of induction should compel us to derive (for each moment) unambiguous consequences. Of course there are other reasons to believe that the same object, the moon, can appear with different shapes and sizes, but they are not the simple result of inductive inferences.

Is this a solution of the paradox? Actually, we need to consider the definition of inductive inference that Hempel (1943) and Goodman tried to develop, retaining that

[t]he central idea for an improved definition [of induction] is that, within certain limitations, what is asserted to be true for the narrow universe of the evidence statements is confirmed for the whole universe of discourse (GOODMAN 1979: 72).

In other words, what I take to be true in my own field of evidence, is conceived as true (by myself, or by somebody who shares exactly the same identical field of evidence) whenever. When this sketch of theory was elaborated, Goodman and Hempel found very quickly their respective "paradoxes" of confirmation, so that such a kind of definition was no more taken as interesting.

It is noteworthy that Goodman and Hempel proposed this idea in relation to a (monotonic) approach to logics (according "classical" to FITELSON, HAWTHORNE 2010, ABRUSCI 1997, BROWN 1977). My conception, instead, accepts the same basic intuition, but within a nonmonotonic approach. We can note in fact that a different way of conceiving inductive associations can be derived from the comparison with a psychological perspective. The kind of anthropology on which I rely is a constructivistic one (thus it is at least similar to Goodman's), and it relates to the image of the cognitive development drawn by Jean Piaget: the newborn child's view of the world is radically egocentric and it does not include the notions of space, time, causality, object (intended as semi-permanent). The comprehension of these notions is the result of the early experiences of the child, and it requires (according to Piaget) about two years of life to be reached at the simple level of sensorimotor intelligence. If we agree to this kind of approach, it is rather natural that we regard induction as a psychological disposition that leads the person to elaborate an image of the world which reflects his/her past life and experiences. In this framework, we must consider induction as a kind of reasoning that *formally* is strictly subjective (in Piagetian terms, "egocentric"), but this does not entail that it yields a form of subjectivism that is exposed to Goodman's charge of "irresponsible relativism". In fact in the individual's life itself there are of course experiences leading gradually to believe that some kind of reference to an objective world is necessary and that some form of intersubjectivity is a condition that very often (and above all in certain specific domains) constitutes an effective clue to say that some belief is true. Such convictions (at least in principle) should be seen as an a posteriori (and formally contingent) acquisition, but this does not bring at all that they must be seen as not quite reliable (just as I know that the sky I am watching is blue a posteriori and contingently, but all the same it is not uncertain for me). In this sense, a form of "responsible" relativism, similar to Goodman's, is at least to some extent confirmed⁸. Piaget's theory has been harshly criticized by many scholars, on the ground of investigations conducted by Baillargeon, Meltzoff, Spelke, Vygotskij and others. Actually we do not need to adfirm that the whole knowledge we own is obtained by induction (nor this was Piaget's opinion), but only that formally what we know by induction (whatever it is) is conditioned by the contents of our subjective experience, thus we do not need to dwell on the objections derived from these researches⁹. For example, nothing in our approach entails that there is not an important role for innate knowledge, in fact this would mean only that the individual cognitive activity is shaped in a way that makes it adapt to grasp some pieces of information prior than others (e.g., those more useful for establishing relations with other human beings), nor we need to determine the width of innate and acquisite knowlegde in such a specific way as it is required by Piaget's theory. Thus some of the main claims against Genetic Epistemology could be easily admitted here, even if in this context we do not need to express such a point of view nor its opposite.

4. Conclusions: art and paradoxes

We have seen that if induction is considered a nonmonotonic form of reasoning, the paradoxes of confirmation cannot arise. The construction of a general framework apt to show in which ways the acceptable inductive inferences – if so conceived – are to be made in relation with the other patterns of our cognitive activity in its generality is an exacting task. Of course, such a goal is utterly beyond the aims of this paper. We can turn again, instead, to the issue of Goodman's aesthetics.

Some of Goodman's characteristic ideas can be here accepted and defended, particularly those concerning a form of relationship between induction and relativism. The reasoning is the following. The reference that we allow to an "individual" side of our knowledge can be used to sustain that arts convey typically contents and pieces of information that *usually* (*i.e.* within the habitual conditions of communication) are not easily shared. On the ground of our approach, it is not necessary that the "individual" knowledge (those pieces of information that are fully available to a single person) is *in contradiction* with the socially shared ones, but in general it happens that the basic interests in the process of communication render difficult to dwell on the more specifically *individual* contents of knowledge. Besides, in many contexts it is required certainly a high skillfulness to succeed in being able to portray such a kind of contents. Nonetheless, we can take them fully as *cognitive*

⁸ Even only on the ground of these short remarks, it is clear that such a line of inquire shuld require the reference to topics concerning not only logic but also theory of knowledge, psychology and philosophy of mind. At least the basic lines of a theory that can deals with this task are contained in my DI PROSPERO (2009, 2012a, 2012b, 2017a, 2017b).

⁹ Subjectivism has been one of the approaches in the study of induction, especially in the Bayesian framework, but the conceptual tools that we are using and the goals of our enquire exempt us from examining it in this paper.

content, even if - at the same time - they own a great power of expressing emotions (just because they have their roots in the depths of the person). The usual opposition that many people find between art and science, depends – we can suggest – on the fact that human cognition is strongly conditioned by nonmonotonicity, thus any difference in the background knowledge become relevant, and thus the "individual" contents of information that art conveys are difficult to be treated in intersubjective and scientific guises (for this reason art should be seen as still tied to «inference» and not to «reference», in the sense of GKOGKAS 2008: 91-92). In the building of the "facts" that Goodman explains by the example of the "starmaking", conventional settlements are involved to coordinate the sets of the several individuals' knowledge, but from the perspective of the single one, the contents that are required are not conventional. Our hypothesis is that art is just a kind of communication where the single one can feel that those symbols that ordinarily are employed on a purely conventional dimension, thus without the capacity of deeply grasping the meaning of the facts for the single person, own the power of better expressing the meaning of the individuals' experience.

In this sense, we can move to Goodman the main objection that he does not take into account the role of the individual experience, that allows, instead, to emphasize the kind of immediacy that arts can convey¹⁰. All the same, we can maintain that arts as science – have a cognitive meaning (and that it is conditioned by induction too). The main difference is that arts grasp the part of cognition that the single individuals find and catch better within their own subjective field of experience. We can admit also the intuitive meaning of Goodman's thesis about the conventional nature of the "facts", even if our analysis of the issue is conventionalist – to some extent – only with reference to that part of knowledge that is socially shared, and that requires in effect to give more weight and particular shapes to certain contents and not to others, so that they can be coordinated and put "in common"¹¹. Also the five "symptoms" of the aesthetic implicitly reveal that arts concern something that is knowledge, but exceeds the store of the meanings of the usual contents of communication. The "symptom" of the exemplification (that is «ubiquitous in the arts and sciences» (ELGIN 2000: 221) is particularly interesting, in that it shows i) a link between scientific sample and art (STEINBRENNER 2009), ii) the complexity of the relation between the individual knowledge and the social and shared one.

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¹⁰ For an interesting comparison with Bergson, see ROMANOS (1977).

¹¹ As it is in Quine's conception of "objective pull".

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