

# **Beyond Toulmin vs. Carnap on ‘Probability’**

**António Zilhão**  
University of Lisbon  
AntonioZilhao@fl.ul.pt

## **I. Carnap on the meaning of probability statements**

For the sake of my argument, imagine, for a moment, that a successful bomb attack against a London tube station has taken place and that, as a result, a significant number of people died or were injured. Now suppose that not long after the attack, the police, following what they considered to be an important lead, arrested a man - let us call him Q. The police suspected that Q belonged to an important terrorist organization, which they thought to have planned the strike. This organization, the police have found out, had a peculiar way of selecting the perpetrators of its attacks, namely, the following. First, the leaders would decide in a central committee meeting to undertake a specific action. However, they would not then choose who would perform it. The organization would keep permanently 100 of its best members in a stand-by status. But only at the very last minute one of them would be chosen to deliver the blow. This choice would then be accomplished by means of a draw from a lottery wheel.

The draw would be set out in motion in the following way.

Each and every one of the previously designed 100 men would be ascribed one number between 1 and 100 by a randomized computer program and no number would be ascribed to more than one man. The lottery wheel would contain 100 balls, each of them marked with a number between 1 and 100.

No two balls would have the same number. After an appropriate time of spinning, one of these balls would be extracted from the wheel. The man to whom the computer would have ascribed the number marked in the ball would then deliver the planned action. In the case of the attack to the London tube station, Q was the man indicated by the organization's lottery system to perform it, or so the police thought.

Eventually, Q was charged with having perpetrated the attack and was brought to court.

In the course of the trial, he acknowledged both being a member of the terrorist organization in question and having been one of the 100 operatives it had kept in a stand-by status prior to the attack. However, and in spite of the evidence the prosecution presented against him, he denied having been the bomber in this case. Thus, it was up for the jury to issue a verdict concerning his guilt. Obviously, no member of the jury had had any previous contact with Q, or the terrorist organization he admitted belonging to. Having been instructed to deliver the verdict 'guilty' if and only if such a verdict had been established 'beyond any reasonable doubt', what the jury had to decide was whether the probability that Q had been the material author of the bombing was high enough to justify his conviction.

Q's lawyer pleaded that, given Q's confession that he had been one of the 100 operatives kept in a stand-by status by the terrorist organization prior to the strike, and given the absolute ignorance the police showed concerning the results of the draw from the lottery wheel, the only objective fact concerning his guilt was that the probability of his having been the perpetrator of the attack was very low, namely, of only 1%.

This, of course, meant that the probability of his not having been the perpetrator of the attack was much higher, namely, of 99%.

Under such circumstances, so the lawyer argued, no jury could possibly find a defendant guilty 'beyond any reasonable doubt'.

Therefore, Q should be acquitted.

The prosecution pleaded that, although nobody actually saw Q detonating the bomb, the police were able both to collect credible testimonial reports placing Q at the crime scene immediately before the blast and to find traces indicating that Q had handled the explosive materials used in the bombing. Thus, considered together, the different pieces of evidence made Q's guilt highly likely.

Therefore, Q should be convicted. After lengthy and careful deliberation, in which both the evidence put forth to the court by the prosecution and the arguments produced by the defence were carefully scrutinized, the jury ended up issuing a guilty verdict against Q.

Thus, this verdict was reached despite the fact that, given the details of the police report concerning the decision procedures followed by the terrorist organisation Q acknowledged belonging to, every member of the jury accepted Q's lawyer argument that the probability Q had had of being the perpetrator of the attack was extremely low, namely, of only 1%, and

therefore the probability he had had of not having been the perpetrator was overwhelmingly superior, namely, of 99%. How then is it possible to conceive that one man might have been considered by a group of other reasonable men to be guilty, beyond any reasonable doubt, of having performed a deed, when the probability of his having done it was of only 1%?

Finding an answer to this question is what makes this story interesting for my purposes here.

Intuitively, an appropriate way to solve this problem and thus to understand why the decision of the jury was in favour of the prosecution rather than in favour of the defence is to claim that one and the same event – Q's perpetrating a bomb attack to a tube station in London – was actually the focus of two completely different assessments of probability. And that each of these assessments resulted, in turn, from the triggering of a distinct concept associated with the use of the word 'probability'.

One of these concepts is concerned with the objective chance Q had, prior to the draw, of being chosen to be the bomber, given his position in the organization as an operative in stand-by status and the lottery system followed in choosing the perpetrator of each attack; the other concept is concerned with the extent to which the evidence collected by the police after the blast made probable the thesis that Q had been the actual bomber.

The former probability concept seems to apply to objective facts in the empirical world, namely, facts about the extraction of balls spinning around in lottery wheels; as such, this concept seems to apply to something which is wholly independent from any sort of evidence which may have been gathered in the course of the police investigation. The latter probability concept, however, seems to be measuring the extent to which a particular theory is confirmed by the evidence produced in its support. In the case at hand, it seems to be measuring the extent to which the theory devised by the prosecution in order to explain how the bombing came about was confirmed by the evidence put forth before the court. Therefore, such a concept seems to apply to theories about the world rather than to the world itself; as such, it is relative to the particular evidence gathered in support of the theory or hypothesis it is classifying.

Thus, the members of the jury thought it was their job to assess whether the theory put forth by the prosecution was indeed highly confirmed by the evidence brought before them and their assessment was

that it indeed was. And, in order to reach that decision, the probability indicated by Q's lawyer regarding the unlikelihood of his being chosen to be the bomber by the organization he belonged to could simply be ignored. As a matter of fact, any one of the 100 operatives would have had the same probability of 1% of having been chosen to be the bomber. So, in this respect, there was no difference between Q and any of the other 99 operatives of the organization who had been in a stand-by status previous to the draw.

Granting that the terrorist organization Q confessed belonging to indeed ordered the attack, whoever had actually perpetrated it had had a probability of 1% of becoming the bomber. However, given the crime scene evidence and the testimonial reports collected by the police, the probability that Q had been the perpetrator of the attack was much higher than the probability that anybody else had played that role.

Therefore, the latter probability was the appropriate one to be taken into consideration by the jury, as it actually was.

This solution to the problem of how to understand the way this imaginary jury handled its task is similar to the one Carnap put forth in his famous book *Logical Foundations of Probability* (1950), in order to account for the way different probability statements should be analysed. There, he presented a proposal according to which it is possible to extract two different concepts of probability from the fuzzy conceptual structure of pre-scientific thinking. One of these concepts of probability is best captured by its scientific explication in terms of the logical-semantic idea of the degree of confirmation of a hypothesis with respect to the set of sentences describing the evidence. Carnap labelled this concept 'Probability1'.

Probability1 corresponds to the concept of probability involved in the jury's deliberation concerning Q's guilt. This is a concept of probability usually called 'epistemic'.

The other concept of probability Carnap thought possible to identify in pre-scientific thinking is best captured by its scientific explication in terms of the empirical idea of the relative frequency of an event with respect to a long sequence of instances of the mass phenomenon in which it takes place. Carnap labelled this concept 'Probability2'. Probability2 corresponds to the concept of probability involved in determining the probability Q had of having been chosen to be the perpetrator of the attack by the organization he belonged to, given the choice procedure that was in place. This is a concept of probability usually called 'empirical'.

According to Carnap, both Probability<sub>1</sub> and Probability<sub>2</sub> are legitimate scientific concepts. Therefore, the development of the scientific approach to probability ended up preserving and belabouring the pre-scientific distinction in meaning already present in the original uses of probability terms in ordinary language. The upshot of Carnap's thesis is that philosophical discussions about the appropriate analysis of *the* meaning of probability statements are pointless and should be discarded.

## II. Toulmin on the meaning of probability statements

In the essay "Probability", the second in his collection *The Uses of Argument* (1958), published almost a decade after Carnap's *Logical Foundations*, Toulmin agreed with Carnap that it was indeed a mistake to look for a single unified reference in terms of which all the uses of the term 'probability' could be accounted for.

However, he also maintained that it was equally senseless to try to correct this mistake by appealing to the idea of there being two (or more) different references associated with the appropriate uses of this term rather than one.

How can these remarks be made to be compatible with each other?

How can you agree that it is wrong to look for a single reference to account for different uses of a term and, at the same time, contend that it is equally wrong to suggest that there is a plurality of such references?

In order to try to understand how Toulmin answered this question, we have to know something more about the way he thought we should understand how the term 'probable' and its cognates are actually used in ordinary language sentences of probability ascription.

His view in this respect was that such terms are *modal modifiers* that modulate the *force* with which a speaker is disposed to assert or to assent to the statement or proposition he attaches to them. *Qua* modal modifiers, belonging to the same family of words as e.g., 'possibly', the use of such terms would not impinge on the *meaning* of the statements or propositions to which they were attached.

On the other hand, and still according to Toulmin, the force associated with an act of assertion or with an act of assent was supposed to be an indicator of the speaker's conviction, or the lack of it, regarding the truth of the sentence asserted or assented to in that act.

Therefore, Toulmin viewed the use of a probability term to introduce a sentence as the use of a linguistic device the purpose of which was to indicate the intensity of the speaker's *conviction* or *confidence*, or the lack of it, in the truth of a sentence or phrase.

However, despite having established such an intimate connection between our use of probability terms and the intensity of psychological aspects, such as confidence or conviction, Toulmin did not altogether sever the ties linking sentences of probability ascription with the traditional definitions of probability. Actually, he maintained that, by helping expressing our conviction or confidence in the truth of a sentence or phrase, our uses of probability terms and its cognates were also connected, not only with frequencies in the long run, but also with support or confirmation relations, as well as with other traditional forms of defining probability not favoured by Carnap, such as Laplace's classical ratios of favourable cases to the total number of cases.

This contention needs clarification. It certainly is not obvious how some or all of these connections could be simultaneously present in the occasions of use of probability terms. Toulmin's idea in this respect seems to be the following. Feelings of confidence or conviction in the truth of a sentence do not simply exist in a speaker. They *respond* to something. More in particular, they are supposed to co-vary with the quality of the *evidence* backing the utterance of that sentence.

And, according to Toulmin, frequencies, evidential support, or the ratio of the favourable cases to the total number of cases, as it may be fit to the nature of the case, rather than defining a putative independent concept of probability, constitute precisely the relevant types of evidence that typically back the way we formulate our judgments in which probability terms occur.

By providing evidence concerning the truth of the sentences probability-terms classify, and thus by co-varying with the confidence or conviction with which such sentences are asserted or assented to by a speaker, support relations, ratios or frequencies in the long run also provide, according to Toulmin, a means of measuring such conviction or confidence the agents have in the sentences in question. Thus, what is measured by such measurements is not the magnitude of some independent entity belonging either to the objective world of physical facts or to the abstract world of logical relations.

*A fortiori* it is not the sort of entity Carnap might want to call 'probability' and that he might want to define in terms of either the concepts of Probability<sup>1</sup> or of Probability<sup>2</sup>.

Toulmin's two remarks above can then be made compatible with each other by means of the introduction of the idea that the use of probability terms in sentences of probability ascription has a *non-referential* character.

And indeed the upshot of his essay was that the term 'probability' and its cognates had a single, undivided, non-referential meaning in ordinary language, and that any proper account of the 'scientific' concept of probability would have to depart from a correct understanding of that meaning. Therefore, from his perspective, the pointlessness of the philosophical discussions Carnap talked about was real; it had, however, a different and deeper source than the one the latter diagnosed.

### III. Toulmin and the subjective view of probability

Toulmin's ideas concerning how our use of probability-terms may contribute to help measuring an agent's conviction or confidence, or the lack of it, in the truth of a sentence establish a clear link between his account of probability and the so-called 'subjectivist' approach to this topic. I think that the understanding of the nature of such a link will be instrumental in revealing the extent to which Toulmin's standpoint departs from Carnap's.

As a matter of fact, and as is widely known, the latter refused to acknowledge any credibility to the subjectivist approach to probability until very late in his life.

However Toulmin's approach and the subjectivist one, although closely connected, are not congruent. Let us then see more in detail how these two standpoints differ and what is common to both.

According to the subjectivist view, a sentence of probability ascription is a measurement of someone's degree of belief in a certain sentence *p*.

Typically, such measurements are to be viewed as being made from the third person perspective. It is the *observer* that ascribes a probability measure to the subject's degree of belief in the truth of a certain sentence *p* based on the odds at which he finds out the subject will be disposed to bet on the truth of *p*. It is certainly true that, as some authors remark, as soon as he becomes familiar with the procedure, the subject himself may decide to internalize the observer's role and to place himself in his imagination in a

betting situation in order to figure out the odds at which he would be disposed to bet on the truth of any sentence he might envisage. But the fact that such a procedure might be possible does nothing to change the essence of the matter. The only thing it shows is that the subjectivist standpoint assumes that the subject does not need to know anything relevant about his dispositions to accept bets prior to his involvement in the betting procedure, be it an explicit one, elicited from the outside, or an introspective version of the former, staged only in his own imagination.

Be this as it may, sentences of probability ascription, in this sense, do not somehow classify the aspects of the world referred to by the complements of the ascription-sentences. They are sentences about the (not necessarily conscious) cognitive life of agents. As such, they are tools of behavioural and psychological inquiry and belong from the outset to the world of scientific theorizing. This being the case, it becomes clear why it is that, for a subjectivist, and contrary to Toulmin's view, it makes no sense to claim that the use of a probability term in a sentence of probability ascription might be regarded as being somehow similar to the use of a verbal replacement or, maybe better put, of a verbal way of strengthening those elements of an expression of conviction that are usually displayed simply in terms of the tone of voice with which the sentence is stated and/or the bodily expression accompanying such an expression. Thus, it seems safe to conclude that Toulmin and the subjectivists are in a clear disagreement concerning the way one should interpret the meaning of sentences of probability ascription.

But, in reality, this conclusion does not follow. In fact, appearances notwithstanding, when Toulmin talks about the meaning of sentences of probability ascription and when the subjectivists talk about the meaning of sentences of probability ascription they are not talking about the meaning of the same kind of sentences. That is, instead of disagreeing about how to interpret the meaning of a previously identified set of sentences, what they are doing is actually putting forth different views concerning the meaning of different sets of sentences.

In order to try to clarify this point, I think it might be useful to recall at this stage some important remarks made by Wittgenstein in his mature philosophy of mind. The remarks I am thinking about are those he made concerning the semantics of first-person sentences of inner experience of the kind of 'I'm in pain' as opposed to the semantics of third-person sentences of



ascription of inner experience, such as, e.g., 'He's in pain'. According to these remarks, whereas the former sentences should be regarded simply as *expressions* of pain, similar in that respect to more elaborate forms of moaning or crying, the latter should be regarded as genuine declarative sentences by means of which actual cognitive assessments of states of affairs in the external world could be performed.

As is well known, Wittgenstein brought back the origin of the conceptual confusions he considered western philosophers became systematically entangled in concerning the foundation of our knowledge of the external world to their inability to perceive correctly this important semantic distinction and thus to their insistence in treating first-person sentences of inner experience as if they were the result of a process of knowledge acquisition. This is, however, a story we do not need enter into right now.

Wittgenstein's semantic diagnosis does not imply that I-sentences of inner experience may not be cognitively useful.

Obviously, the sufferer's use of the sentence 'I'm in pain' in order to express his pain constitutes, even when one assumes the correctness of Wittgenstein's analysis, a reliable indicator of his suffering to the external observer. Thus, although not endowed with a cognitive nature *per se*, the production of such sentences, under the relevant circumstances, provides an appropriate behavioural basis for the justification of ascriptions of pain to the sufferer by an observer and even for the production by the latter of sentences measuring the intensity of such suffering.

Now, the sentences Toulmin analyses in detail in his essay are ordinary language sentences in which 'probably' and similar terms occur; with respect to these, he convincingly claims that the point of their use is to *express* conviction or confidence, or the lack of them, not to *describe* anything concerning the inner cognitive life of the speaker.

Subjectivists, on the other hand, associate, as mentioned above, sentences of probability ascription with sentences reporting the result of elaborate psychological experiments; and convincingly claim that these sentences have a clearly referential use, the reference of which is the degree of belief of an agent in the truth of the sentence qualified by the probability ascription.

Our common way of using 'probable' and its cognates in ordinary language sentences of probability ascription is, however, a wholly different game than the one they are interested in; it is, moreover, a game the subjectivists may legitimately consider not to be their business to address.

Clearly, Toulmin's view regarding the semantics underlying our use of probability terms in ordinary language sentences of probability ascription is similar to Wittgenstein's view regarding the semantics of I-sentences of inner experience (the probability terms featuring in them *express*; they do not refer). From this semantic peculiarity, it follows, according to Toulmin's standpoint, that those guarded assertions we make by associating a sentence with a probability qualifier are about the world and not about our feelings of conviction or confidence in the truth of the sentence we are thereby asserting. That is, by means of such sentences we express the latter, but the sentences themselves are about the former.

By contrast, according to the subjectivist view, sentences of probability ascription are, as mentioned above, about the strength of an agent's beliefs concerning whatever such beliefs are about and not about the object of those beliefs. They are, therefore, similar to third-person sentences of ascription of inner experience, according to Wittgenstein's analysis.

Obviously, two parties are not (necessarily) disagreeing by presenting different descriptions of the meaning of different sets of sentences.

Once the initial impression that they might be talking about the same kind of sentences reveals itself to be an illusion, the ground becomes clear for us to realize that, besides having different foci of theoretical interest, the two standpoints do actually have something important in common. What this point in common is can be made clear by the following pair of remarks.

For a subjectivist, the use by an agent of a token of the kind of ordinary language sentences containing probability terms Toulmin analysed may perfectly well be taken by the external observer to be an *indicator* of the value of the agent's degree of belief concerning the truth of the complement sentence referring the aspect of the world it is about, even if, as Toulmin claims, the original complete sentence of our ordinary language does not *refer* to such a belief. That is, just as the utterance of I-sentences of inner experience by an agent provides evidence in terms of which the ascription of third-person psychological sentences about that agent by an observer might be justified, the utterance of one ordinary language sentence of probability

ascription by a speaker can function as *evidence* in terms of which a tentative ascription of an approximate degree of belief to such a speaker might be justified. Obviously, from the subjectivist standpoint, a proper, reliable, ascription of a quantified degree of belief to that speaker would need to be made later based on a properly set sequence of betting procedures.

Similarly, I see no reason why Toulmin could not accept that a branch of psychological theorizing might specialize in measuring quantitatively the conviction or confidence agents have on the truth of sentences, and produce other sentences containing the outcome of such measurements, as long as the practitioners of that branch of knowledge would not contend, as they do not, that such measurements were to be made in terms of a semantic interpretation of the sentences of our ordinary language containing probability terms.

There is, as a matter of fact, an obvious link between degree of belief, on the one hand, and conviction, or confidence, on the other hand, namely, the following: the bigger the former is, the higher the latter is, and the lower the former is, the lower the latter is.

Given the fact that, as has been showed by a number of different authors, the quantitative measuring of degrees of belief by means of betting procedures, as long as it is supplemented with an assumption of coherence, satisfies the axioms of probability theory, there seems to be no reason why a defender of Toulmin's standpoint should not accept the cogency of the use of the concept of subjective probability in order to measure quantitatively an agent's confidence in the truth of a proposition as it is *expressed* in, *inter alia*, ordinary language sentences of probability ascription.

This is all the more important because our confidence in the truth of a certain sentence does not need to be based on the knowledge of the relevant evidence concerning frequencies or the ratio of favourable cases to the total number of cases. Similarly, our conviction that a certain sentence is not true does not need to be based on the lack of knowledge of the relevant evidence.

People do have hunches, prejudices, and unexplained convictions.

Therefore, *pace* Toulmin, the conviction one has is not always the conviction one is entitled to have given the evidence one has. Not even Toulmin would deny, I suppose, that it would be foolish to sustain that the poor evidence an agent has concerning the truth of a sentence could be unguardedly used in order to provide an approximate measure of the intensity of his conviction in its truth in cases in which he expresses a

guarded but nevertheless high degree of confidence in such truth by means of its inclusion in a sentence of probability ascription. Thus, the introduction of betting procedures as a means of measuring degree of belief, and, therefore, conviction, or the lack of it, in the truth of a proposition, independently of the evidence the agent may have gathered concerning such truth, does seem to be an important source of psychological realism introduced in the field of action-explanation by subjectivists.

To sum up, despite their disagreements in other respects, both Toulmin and the subjectivists claim that probability is linked with an agent's psychological state, namely, confidence, conviction or degree of belief in the truth of a sentence, and not with whatever entities, abstract or concrete, might exist in the world outside of the subject.

They are in this respect clearly together and in clear opposition to Carnap.

#### **IV. Carnap, Toulmin and Folk-Probability**

I am in favour of dualism in matters of philosophy of probability. My view differs from Carnap's however. Like him, I think that chances, understood as that which is measured by an empirical-objective concept of probability, exist "out there" in the world, and are fully independent of us.

By this I mean that the actual value of such probabilities depends neither on the evidence we happen to have gathered, nor on any agent's or community of agent's degrees of belief in the truth of any sentence or proposition referring to a relevant aspect of the world. Unlike him, I think that degrees of belief of an agent in the truth of a sentence or proposition are also appropriately measured by a probability concept. Moreover, I follow the subjectivist view in equating epistemic probability with justified degree of belief. Thus, I do not accept the Carnapian doctrine according to which epistemic probability marks out an independent concept of probability.

But this talk is not about my views on what is the right way of carving out the outlines of a scientific concept of probability. It is about what, borrowing an expression from contemporary philosophy of mind, one might term 'folk-probability'. As mentioned above, Carnap claimed, in this respect, that a pre-scientific concept of probability of an empirical-objective nature exists in people's minds prior to its formalization in scientific thought. The question I want to address now is the following.

Is Toulmin actually right in his contention that this Carnapian idea is bogus? Not that this question would matter much to Carnap. He did not picture himself as being involved in the writing of a sort of *History of the Development of the Concept of Probability in the Human Mind*, when he wrote his introduction to the *Logical Foundations of Probability*. Presumably, he would accept with no particular qualms a charge of the historical-psychological falsity of his story made by a specialist in conceptual History, as long as such a story would help him fulfil his actual purpose of conceptual clarification of the two concepts of scientific probability he considered there to be. But even if it did not matter much to Carnap, it mattered to Toulmin, and it matters to me.

On what grounds are we to adjudicate the dispute between Toulmin and Carnap then? On the one hand, the distinction Toulmin draws between the force of the modal term 'probably' and the criteria for its use sheds some light into the way we *do* use some sentences of our ordinary language. On the other hand, it is hard to accept that nothing substantial is being dealt with in the debate around the question of how best to interpret our unanalysed notions of probability.

The strategy followed by Toulmin to deal with this issue is to bring back the study of what non-formal probability might be to an analysis of the meaning of ordinary language sentences of probability ascription. The principle underlying the use of such a strategy seems to be the principle that, whatever a pre-scientific concept of something might amount to, our only clue to determine its content is the analysis of the way normal agents use the sentences of ordinary language carrying the term allegedly referring to it in their relevant contexts. Indeed, it was Toulmin himself who ascribed to the essay "Probability" the status of a "pilot investigation" introducing ideas and distinctions that throw "a general light on the categories of rational assessment". These words indicate clearly that he took such a principle to be of a general scope and thus that it ought to be applied to different categories used in the rational assessment of arguments.

However, it seems to me that, even if we grant Toulmin that he is right in his analysis of the semantics of many of our ordinary language sentences of probability ascription, there are other sources of information concerning the lines that mark out the categories belonging to our pre-scientific or non-scientific thinking that he neglects. Prominent among these is, I think, empirical psychological research.

I suppose Toulmin would reply to such a charge of negligence with the claim that his purpose was critical rather than descriptive.

Nevertheless, it is hard to see how he thinks he can avoid psychological research, given the fact that he also claims, against mainstream logicist theories of argument assessment, that the critical understanding of the criteria of argument assessment he wants to reach should be grounded in our actual practices and concepts. But, surely, alongside with the semantics of ordinary language sentences, empirical psychological research has also relevant things to say on what the content of our non-formal concepts is. I suppose one would have to be a strenuous defender of some strong version of the Sapir-Whorf thesis in order to deny this. That is certainly not my case.

Indeed, there are many studies in the psychology of probability that are of importance to philosophers. Among these, I would like to highlight, on the one hand, those that study practices people get involved into that seem to show that something like a concept of probability is present in the background of their activity, irrespective of the language they use in association with it (betting is precisely a case in point), and, on the other hand, those that study the way people respond to explicit tasks and questionnaires that test the way they conceptualize problems in which the notion of probability seems to be implicitly involved. I am convinced that the results produced by these studies do need to be taken into account if a “true-to-life” analysis of probability arguments is to be made, as Toulmin intended. I command no comprehensive knowledge of this literature. I looked into some studies of the latter kind though. And I did not find the information they provided to be negligible for the participants in a debate on argumentation theory. Let me present to you some important results I gathered from them.

The one that stood out the most was the result that subjects themselves claim having some kind of a spontaneous notion of probability. This result was certainly not obvious from the outset and I do not think it should be discarded as being of a merely ‘verbal’ origin. Moreover, still according to such results, this concept tends to be described as serving the purpose of measuring something else; whatever this something else might be is most frequently called either ‘chance’ or ‘randomness’.

Of course, these two results, by themselves, are not particularly illuminating until one is presented with further results concerning what it is that these subjects call 'chance' or 'randomness'. Therefore, I looked into that too.

I made a list of six different responses subjects were reported as having given concerning what it was that they associated with the terms 'chance' or 'randomness'. The list is the following. A first group of responses associated these terms with whatever it is that 'we did not predict'. A second group with 'what is unpredictable'. A third group with 'what is done without reflection'. A fourth group with 'what is uncaused'. A fifth group with 'what we cannot control'.

And the sixth and last group associated 'chance' or 'randomness' with 'coincidences'. We find here connections with an objectivist view of probability (e.g., 'what is uncaused'), with a subjectivist view (e.g., 'what we did not predict'), and also inconclusive answers (e.g., 'what we cannot control'). So, the list, by itself, is not revealing as to the nature of this hypothetical folk-concept. However, it becomes more revealing when it is associated with the following two further results I also came across.

The first is that almost always each subject gives more than one of these responses, depending on the nature of the situation he envisages involving what he calls 'randomness' or 'chance'. That is, it is in general not the case that subjects give only one response of a single nature and stick by it. The second is that, when different subjects are placed before a series of sentences, each of them describing events connected with some of the above given definitions, and are asked to group them according to their similarity, the result is almost always the same: the sentences are divided into two large groups – the group of the sentences referring to isolated events (an unexpected meeting with a friend in the street, the fall of a tile from a roof on the head of a passer by, etc.) and the group of the sentences referring to repeatable processes or events (a ball exhibiting a particular number withdrawn from a lottery wheel, a throw of the dice, a coin throw, etc.).

If anything, what the stable constitution of these groups suggests, is that, if indeed it makes sense to speak of the existence of intuitive pre-theoretical notions of probability among unsophisticated subjects, then there probably are two such intuitive concepts rather than one in the minds of those who associate whatever it is they call 'chance' or 'randomness' with the use of probability terms to measure it.

As a matter of fact, if only a single probability term were in use here, the stability of this grouping pattern across subjects would have to remain unexplained. Thus, I think that the spontaneity and the uniformity of this way of grouping these sentences constitute evidence against Toulmin's single-view of probability. On the other hand, and as far as I could see, nothing in the inner organization of the group of sentences describing isolated events indicates that the probability-judgments measuring the degree of 'randomness' that is associated with them are portrayed as having to be somehow conditionally produced on the available evidence. Thus, the lines demarcating these groups do not seem to do justice to the dichotomy separating Carnap's Probability1 and Probability2 concepts.

This does not mean, however, that these lines are necessarily closer to the dichotomy separating subjective from empirical-objective views on probability. As a matter of fact, there is no indication that the sort of chance or randomness subjects associate with sentences describing these events is somehow dependent upon their putative degrees of belief concerning the truth of the sentences describing them rather than with the events themselves, although the former dependence is indeed a possible way of rationalizing their response. It is important to recall here that there are other studies in the psychology of probability consistently showing that people seem to experience troubles respecting the assumption of coherence. And it remains to be seen whether or not it is possible to make sense of a concept of quantitative degrees of belief defined independently of this assumption.

Thus, according to these data, at least, it is not clear how one might classify the sort of probability concept, assuming there is one, people associate with the randomness they seem to consider to be characteristic of single events of the above-mentioned kind.

Be this as it may, these data appear to justify Carnap's thesis according to which there really is an intuitive folk-concept of objective probability associated with repeatable events.

Of course, by themselves, the data do not allow us to discriminate between Carnap's own frequentist view of empirical-objective probability (Probability2) and the classical Laplacian view of ratios of favourable cases to the total number of cases. But this is presumably consistent with the fuzzy nature of folk-concepts.



Obviously, results like these are just a drop in the ocean of psychological research on probability. I do not know how well they generalize beyond the samples that were tested.

So, it is advisable to refrain from sweeping generalizations.

Presumably, they are also compatible with interpretations that differ from mine. But I do not think that my interpretation of them is inconsistent, or that it peruses data beyond what is reasonable to squeeze out of them.

Most importantly, however, I think these results show that the studies that produced them, together with a myriad of similar studies, provide relevant information concerning the content of the folk-notions in use in practical argument assessment; and that no responsible debate on non-formal argumentation theory can afford to ignore such information in the way that Toulmin and Carnap obviously did.

## Bibliography:

- Carnap**, R.: *The Logical Foundations of Probability*. Chicago: University of Chicago Press, 1950.
- Gauvrit**, N.: *Vous avez dit hasard? Entre mathématiques et psychologie*. Paris: Belin, 2009.
- Gigerenzer**, G.: *reckoning with risk: learning to live with uncertainty*. London: Penguin, 2003.
- Gillies**, D.: *Philosophical Theories of Probability*. London: Routledge, 2000.
- Gilovich**, T., Griffin, D. & Kahneman, D.: *Heuristics And Biases: The Psychology Of Intuitive Judgment*. Cambridge: Cambridge UP, 2002.
- Griffiths**, T. L. & Tennenbaum, J. B.: "Probability, Algorithmic Complexity, and Subjective Randomness" in *Proceedings of the 25<sup>th</sup> Annual Conference of the Cognitive Science Society*, 2003.
- Hacking**, I.: *An Introduction to Probability and Inductive Logic*. Cambridge: Cambridge University Press, 2001.
- Howson**, C. & Urbach, P.: *Scientific Reasoning: The Bayesian Approach*. La Salle (IL): Open Court, 1993.
- Jeffrey**, R.: *Probability and the Art of Judgment*. Cambridge: Cambridge University Press, 1992.
- Jeffrey**, R.: *Depois do Empirismo Lógico/After Logical Empiricism*, (bilingual edition, with a portuguese introduction by Zilhão, A.). Lisboa: Colibri, 2002.
- Jeffrey**, R.: *Subjective Probability: The Real Thing*. Cambridge: Cambridge University Press, 2004.
- Kahneman**, D., Slovic, P. & Tversky, A.: *Judgment under Uncertainty: Heuristics and Biases*. Cambridge: Cambridge University Press, 1982.
- Kneale**, W.: *Probability and Induction*. Oxford: Oxford University Press, 1949.
- Laplace**, P. S.: *Essai Philosophique sur les Probabilités*. Cambridge: Cambridge University Press, 2009 (1<sup>st</sup> edition: 1820).
- Lecoutre**, M.-P.: "Cognitive Models and Problem Spaces in 'Purely Random' Situations" in *Educational Studies in Mathematics*, 23, 557-568, 1992.
- Mellor**, D. H.: *Probability: A Philosophical Introduction*. London: Routledge, 2005.
- Nickerson**, R. S.: "The Production and Perception of Randomness" in *Psychological Review*, 109, 330-357, 2002.
- Ramsey**, F. P.: "Truth and Probability" in his *The Foundations of Mathematics and Other Logical Essays*. London: Routledge & Kegan
- Paul**, 1931.
- Reichenbach**, H.: *The Theory of Probability*. Berkeley (CA): University of California Press, 1949.
- Savage**, L.J.: *Foundations of Statistics*. New York: Wiley & Sons, 1954.
- Toulmin**, S.: *The Uses of Argument*. Cambridge: Cambridge University Press, 1958.

## Beyond Toulmin vs. Carnap on 'Probability'

**Von Mises, R.:** *Probability, Statistics, and Truth*. London: Allen & Unwin, 1957.

**Wittgenstein, L.:** *The Blue and Brown Books - Preliminary Studies for the Philosophical Investigations*. Oxford: Blackwell, 1958.

**Wittgenstein, L.:** *Philosophische Untersuchungen in his Werkausgabe - Band 1*. Frankfurt a.M.: Suhrkamp, 1984.