

Claims of “uniqueness” in forensic medicine

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Abstract: The rationale of this paper is based on a deep fascination with the nature of identification, not only from a scientific point of view, but also from an existential and ethical perspective. In the field of Forensic Medicine the identification get extreme significance for a living person, being a proof of his or her existence. Especially in the modern society where everything has to be identified in order to be proved, identification is crucial. This paper is an attempt to make a philosophical approach to some identification methods, which are claimed by their supporters to be based on the theory of “uniqueness”. It is a challenging claim which is counteracted in an argumentative discussion. The conclusions of these paper are: uniqueness should not be used in forensic science, as it belongs to the realm of a pure philosophy because the “uniqueness” is impossible to prove.

Key Words: individuality, proof, visual identification, identification methodologies, forensic examiners, forensic odontologist, fingerprints, probability models, Snowflake syndrome, uniqueness.

The word uniqueness [1] appear very often in the arguments as a statement of truth and aims to justify the results as being “a proof” [2] of individualization; two samples match each other. The concept of uniqueness is based on inductive reasoning, where the thinking goes from the particular to the general. We collect evidence from the phenomena s observation from which we formulate premises, that lead to a general conclusion.

An inductive conclusion is a probable conclusion which is strong or weak. A good example is: 10.000 dogs are examined for fleas. Every examined dog has fleas. Then I assume all dogs must have fleas. But this is not exhaustive. 10.000 dogs are not all dogs! The concept of induction will be discussed further down in this paper.

Modern scientific forensics and philosophy, both favors the hypothetical-deductive model. Deductive thinking is based on the following:

- If something is true for a class of things in general, then this is true also for all members of that class.

This type of reasoning starts with presenting

a general statement, a hypothesis or a theory. Then it proceeds with examining the possibilities for testing. A deductive reasoning leads to a valid or invalid conclusion avoiding erroneously generalized statements.

It is without a doubt that fingerprints analysis and ballistics have contributed to the conviction of guilt in crimes. It is also true that forensic odontologists using dental formulas and bite marks have been successful in identifying dead bodies of a long time missing individuals, thus making it possible for the families to get their beloved ones back. But, there is another side of the coin. Today, more than ever, forensic science is under review and scrutiny due to the repeatedly reported errors that have convicted the innocents and falsely identified people as being dead. How can this be possible, when technology is at its peak of development possessing instruments that are designed to give precise and accurate results, giving high qualified expertise, are more available than ever? Are these errors technological or human perceptual and cognitive? And if they are human are they due to misuse, incompetence, bias, lack

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of understanding of the epistemology principles? [3, 4]. In order to give an answer to these questions, we have to examine the errors from the aspect of “uniqueness”.

The National Academy of sciences reports 2009 concluded “that in most forensic science disciplines, no studies have been conducted in large populations to establish the uniqueness of marks or features”[5]. It further concludes that these disciplines cannot and should not be demonstrated by addressing to their uniqueness. Criticism has also arrived from academic circles, arguing that the so – called “proof” of individuality is an absurd statement and unproven.

Why do then forensic examiners, at some point, still argue about the uniqueness of their theory?

METHODS

The argument is that there are not found two objects that are identical of each other. And of course, it may be absolutely true that they have never found a match that is identical to the other. This argument is tempted to be counter-argued by the next question. Are the forensic examiners, each of them, actually and truly remember in detail every feature of the objects? Are the examined objects (which are considered to be under the loop of examination) compared to another? The answer is quite obvious. It seems more that their argument is based on an assumption. Hume defined this type of reasoning as induction [6]. The induction model would sound like this: I have made the observation of a number of samples and I have seen that none of them are the same. Therefore I assume that no sample will ever be the same as any other. This reasoning lacks from logic and proof.

There are two aspects which must be highlighted:

1. Let us assume that we don t have evidence of matching samples from a small number of individuals. This does not mean you will not find an identical set in another part of the world, i.e. fingerprints or dentition.

2. The other important thing is the fact that there is no mechanism that prevents two people of having identical features, e.g. fingerprints. There is a very high probability, even if modest population sizes are studied, that matches will be missed when one is conducting a random comparison. This is an argument that has to be seen in the context of the limitation of humans to make millions of comparisons in order to ensure that each one of the samples was examined and compared with each other.

- Fingerprint examiners rely on the argument that random and infinite stress (load in term of forces) and strain (respond to the forces) during uterine life is causing the friction ridges on the skin of the fetus. This leads them to the assumption that friction ridges are also randomly and infinitely produced. The counter argument is that friction ridges may be caused by different causal processes of forces and there are no studies conducted on

the variations of these force variables e.g. skin tension, fluid dynamics pressure, temperature [7].

- Forensic odontologists fall into the same trap. Their argument is that the forces which are acting on the teeth change their position, e.g. natural forces caused by oral muscles or external forces such as a thrusting of the tongue, thumb sucking, are infinite and therefore the dental profile is infinite. There is no study on the magnitude and the variety of forces, this argument seems to be invaluable and scientifically unusable. Another aspect is the relatively small samples that are studied, sometimes less than 100.

If we technically want to argue for the uniqueness of a trait, the probability to find markers or features appearing more than once in the population should be zero and this is impossible, as multiplication which is based on the frequency of the characteristics is used in most probability models. Which is the probability of observing these types of characteristics either alone or in combination with others? The probability is always greater than zero. We can, therefore, assume that a duplicate can always exist, doesn't matter how small it is. Very often forensic examiners round down the probability in order to justify the uniqueness of their theory.

Probability models are assumption models based on statistically modeled combinations of traits, which already contain existing data from the population: DNA [8], fingerprints, dentition, all of them base their statistics on these models. Unfortunately instead of analyzing the frequency of data the analysts often just assume the distribution of traits. Another aspect is that analysts do not verify the frequency of the trait in the population and it is unknown if the samples are truly random or if they truly represent the population.

Another very important concern is that their theory of uniqueness relies on the assumption that the trait of each individual is independent of any other. DNA analysis have accepted the fact that there is no complete independence of alleles by trying to solve it through a mathematical formula, thus demonstrating a more realistic approach to the probability claim [9].

RESULTS AND DISCUSSIONS

Uniqueness seems to be a question of belief more than a scientific rule. Philosophers and sociologists have argued about the common trend of the 20th century among humans, that they consider themselves as being unique. Humans desire to believe in the concept of uniqueness, even if there is no scientific proof for this. Andre Moenssens [10] argues that this well- established concept is based on the term “Snowflake syndrome”. People often associate uniqueness with the snowflake, as they believe that no snowflake looks the same [11]. It is true that there is an astronomically high number of possible arrangements of a molecule (10¹⁵) in a snowflake, but

that still does not mean that there can't be two matches that look alike. In 1988 a researcher documenting for the National Center for Atmospheric Research documented two identically snowflakes and made a hole on the myth of the uniqueness of snowflakes [12, 13].

We believe forensic practice is not favored by the concept of uniqueness for three reasons:

1. Computers and imaging devices are using complex mathematical models in order to calculate the probability of a random match, the data produced by these calculations have no practical importance to nowadays practice in the forensic analysis which is carried out largely by the human eye [14]. A recent study has shown that the identifications were physically unique, but when a device was used they could not be reliably distinguishable when compared [15].

2. The uniqueness of the fingerprints is based on several experiments where duplicate images were used in order to set a match score [16]. The matches were based on the comparison of different images taken from different fingers and not a comparison of the same fingers!

3. For the legal system uniqueness is not as relevant, as accuracy is [17]. The error rate is dependent on the quality of the sample, the skill and expertise of the analyst, as well as the reliability of the examination, has to be the highest priority in order to produce the most accurate results.

CONCLUSIONS

"Uniqueness" should not be used in forensic science, as it belongs to the realm of a pure philosophy. The induction model, which "uniqueness" is based on, does not favor forensic individualization. It is definitely not a scientific conclusion, it is just a pure assumption. The job of the forensic examiner is to collect facts sustained by probative data and not to claim uniqueness which can lead to prejudices; conclusions are not supportable by facts.

Uniqueness is impossible to prove!

Conflict of interest. The authors declare that they have no conflict of interest concerning this article.

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