



# Finding the Truth: Science of Violence

BY GEOFFREY T. DESMOULIN, GTD SCIENTIFIC INC.

GTD Scientific Inc. (GTD) has developed a unique skill set to investigate violent encounters. GTD's Principal, Dr. Geoffrey T. Desmoulin (PhD., RKin., PLEng.), was the science and engineering expert on the hit TV series, *Deadliest Warrior*, and possesses more than 20 years of experience determining how injuries were caused. Dr. Desmoulin has refined the process with his team at GTD, and while the name has begun to turn heads, the approach also solves cold cases.

An essential step to the success of Science of Violence® in finding the truth is validating the evidence, or in other words, assessing evidence for consistency—a step Dr. Desmoulin says is absent with conventional investigations by professionals possessing typical backgrounds (law enforcement, physicians, and engineers). Here, Dr. Desmoulin presents a workflow developed as a critical part of the Science of Violence® process for injury reconstruction in forensic investigations.

## ON THE SHOULDERS OF GIANTS

Previous authors inspired the Science of Violence® process but the workflow presented was applicable only to vehicle accident cases. Evidence from a vehicle can readily establish points of contact with the body, and analysis of vehicle motion can be used to estimate the forces applied to the body as constrained by the vehicle. However, in non-vehicle incidents, once an injury has been defined, there are frequently many possibilities as to the mechanism that caused them, especially if applied to violent encounters. The challenge is to determine which mechanism is consistent with available data. Hence, the Science of Violence® was born.

## THE PROCESS FRAMEWORK

GTD developed a framework for injury reconstruction, which can be applied to any injury, including atypical injuries caused by violent encounters. A distinguishing feature of this framework is the requirement that conclusions are first based on the laws of physics rather than relying on a set of pre-determined medical definitions; and second, be consistent with independent objective data (Fig. 2). Lawsuits frequently involve disputes centered around conflicting accounts of an

incident by witnesses and involved parties. Although their narrative can set the scene, it cannot be accepted as reliable without supporting evidence. Therefore, it is necessary to determine the consistency of testimony with independent objective data.

## CRITICAL FIRST STEPS – DEFINE THE INJURY

The process consists of first defining the injury based on medical records and a review of relevant published literature on the biomechanics specific to the diagnosed injury (Fig. 1). Issues that need consideration when defining the injury include physical tolerance, timing of the injury, and the mechanism of the injury. Physical tolerance is determined by the force necessary to cause the injury. Timing of the injury is important for determining when the injury occurred in the sequence of events and may be established through analysis. The mechanism of injury may be known, or proof acquired through published research. However, it is also possible that the mechanism of injury is unknown, in which case analysis is likely required to ascertain this.

## WHAT YOU HAVE versus WHAT YOU NEED

Early scene documentation including videos, measurements and photos of the location of bodies, objects, damage, bloodstains patterns, etc. relevant to the incident, can provide independent objective data to corroborate witness accounts, as well as input for quantitative analysis. An analysis is often necessary to establish causal relationships between the injuries and the dynamics of the incident. The process may involve methods such as ergonomic analysis, photogrammetry, impact tests, computer models and mechanical calculations, but always includes answering the following three questions: 1) Find the location of the applied load that caused the injury; 2) Find the direction in which the load was applied; and 3) Find the magnitude of the applied load that caused the injury.

## ARE YOU SURE? – REACHING A CONCLUSION

A discussion of the evidence, results of the analysis and independent objective data are required to draw conclusions. Included are elements such as a review of standards relevant to the incident, results of tests that were performed as part

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of the analysis, and the probability of risk of injury under the conditions which existed at the time of the incident. However, before any conclusions can be drawn, an agreement must be established between the different lines of reasoning (Fig. 2). Critically, any conclusions gathered from similar witness accounts or evidence recovered from the scene must be consistent with independent objective data, either derived from the analysis or obtained from independent sources outside of case-related evidence, such as published scientific studies.

The final conclusions should represent a harmony of the data gathered from the case material and independent objective data derived from the analysis and referenced literature. If inconsistencies are found, the process dictates revisiting the analysis and, in some cases, the injury literature, to ensure the data and referenced studies being relied upon are indeed correct, do not include any errors, and are useful in directing the investigation towards the truth. If not, the process is repeated.

### THE END GAME

Dr. Desmoulin and his team at GTD have created a set of courses on The Science of Violence® to present not only this workflow but a series of courses to share how to find the truth behind what really happened in violent encounters.

The Science of Violence® is certified for continuing professional development in British Columbia, Arizona and Washington, and is in the process of being certified in California and other US states. "At GTD, we have developed unique strategies to investigate violent encounters," explains Dr. Desmoulin. "The Science of Violence® allows us to share some of these skills, and help officers document better in the field and attorneys to make better arguments and question more effectively in court. When fingers are being pointed and the truth is hard to find, biomechanical engineering can provide definitive answers."

Interested participants may sign up for The Science of Violence® course at [www.gtdscientific.com](http://www.gtdscientific.com).



Figure 2. Workflow diagram for injury reconstruction



Geoffrey T. Desmoulin, PhD., RKin., EngL., Principal of GTD Scientific Inc., holds two degrees in both Engineering Sciences and Kinesiology, allowing him to predict human injury in any environment. He was previously an Emergency Medical Technician, firefighter and military reservist. Since 2009, GTD Scientific Inc. has garnered Federal and Supreme Court qualifications and an extensive international client list within the legal and law enforcement communities. [gtdesmoulin@gtdscientific.com](mailto:gtdesmoulin@gtdscientific.com)

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[sara@paralegalassociation.com](mailto:sara@paralegalassociation.com)