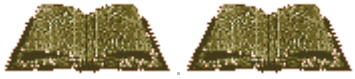
ANIL AGGRAWAL'S
Internet Journal of
Forensic Medicine and Toxicology
The world's first online journal devoted entirely to forensic medicine and toxicology · Published 1 January and 1 July

VOL. 4, NO. 2
Downloaded from www.anilaggrawal.com · ISSN 0972-8074 (Online) · https://www.anilaggrawal.com/ij/vol_004_no_002/reviews/tb/page002.html

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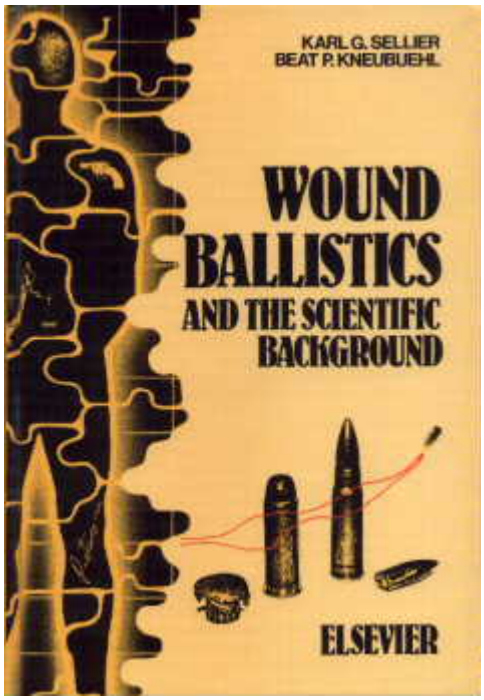
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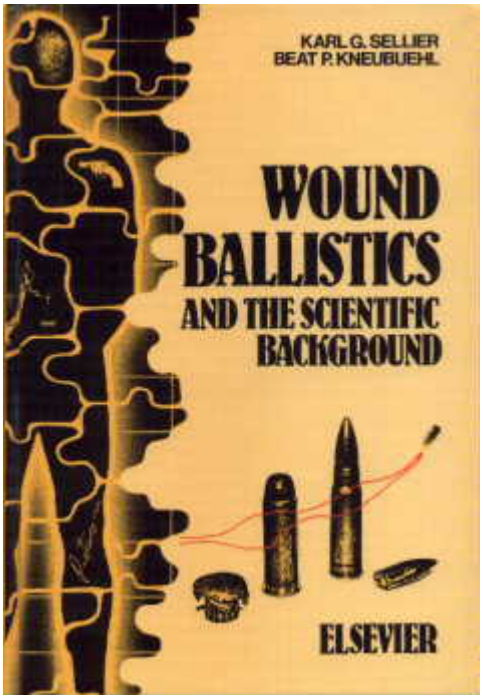
MOST COMPREHENSIVE DESCRIPTION OF BALLISTICS

Wound Ballistics and the Scientific Background, 1st Edition, *by* Karl G. Sellier and Beat P. Kneubuehl (translated into English by Ruth Rufer and Jack Hawley). Hard Bound, 6.5" x 9.5".
Elsevier Science B.V., Sara Burgerhartstraat 25, P.O. Box 211, 1000 AE Amsterdam, The Netherlands. Publication Date 1994. xxii + 479 pages, ISBN 0-444-81511-2. Price $150.00, Euro 150.00

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EXCERPTS



The book explains the concepts clearly and authoritatively. Here are some extracts from page 50 of this book, where the authors explain about the Metal Cartridge case

.. .The "big" metal cartridges first appeared in the United States, where they were used in the Civil War (1861-65). The first examples used Flobert's rimfire system. Shortly thereafter, however, metal cartridges were introduced which used a separate replaceable priming cap inserted in the bottom of the metal cartridge case. It was connected to the powder chamber portion of the cartridge case by a flash hole in the base of the case.

With the introduction of the metal cartridge case, the problem of sealing in the high-pressure gases (obturation)- a major stumbling block in the development of breech-loaders - was finally solved. The pressure resulting from the burning powder pushed the cartridge case tightly against the wall

of the chamber, forming a gas-tight seal that prevented the backward escape of gas. Early cartridges with metal cases were in fact often called auto-sealing cartridges. Again, the ammunition took over a function that had previously been carried out by the weapon itself.

The discussion goes on. This is how the authors then go on to describe the smokeless powder

In the second half of the 19th century, the metal cartridge case, the percussion ignition, and the oblong projectile set the stage for intensive ammunition development. At the beginning of the 1880s, there was little room for further cartridge improvements using available technology. The caliber had been reduced to between 10.5 and 13.6 mm. Projectiles with a mass of 20 to 30 g were being fired with loading quantities of about 5 g of black powder; a muzzle velocity of about 450 m/s was being obtained. However, the trajectory of the projectiles was still quite curved. It was well known to the then still-young science of "ballistics" that flatter trajectories would have required a large increase in muzzle velocity. To increase the powder charge sufficiently to attain the needed velocity increase would cause considerable difficulty; it would have necessitated heavier arms and increased recoil beyond acceptable limits. In an attempt to get around these physical limitations, tests were done with still smaller calibers, since the corresponding reduction of the sectional density led to more favourable interior ballistics conditions.
Around this time also came the invention of smokeless powder, based on nitrocellulose (gun-cotton discovered in 1846 by the German chemist Schönbein). The Frenchman Vielle introduced his "Poudre B". The new powder contributed several important advantages: with black powder only about half of the powder mass was converted into propelling gas, while the rest was released as solids in the form of soot and smoke; the quantity of solid substance formed during the combustion of smokeless powder was less than one percent. Smokeless powder was therefore much more energy efficient and greatly reduced the quantity of dirt.. .

$x = x_0 + v_0 . t + 1/2a.t^2$

$T = m . a . r$

$RSP = p . A . f$

Surprised, amused or simply stunned! If your answer was none of these then answer these questions:

What is D'Alembert's Principle?
What is Haupt's formula?
What is Mach number?
What is Reynold's number?

Have these questions got the grey cells of your brain working? If not then sample a few more:

Do you remember the Bernoulli's theorem?
Or can you use the calculus as easily as you can speak English?
Or do you remember the physical properties of gases?
Or the Poisson's formula and the Young's modulus?

View this book on Amazon

Don't take this to be some sort of an exam. These are just a few of the many questions that one has to answer before one starts using this book. But the other side of the coin is that you won't be

required to read this book, (at least not in your professional life) if you are not aware of these terms. If you have forgotten some or all of these terms and are too lazy (like me) to open your high school books, the authors have described the required basics of physics and mathematics in chapter 2. And the good part is that they have not explained everything at one place. They have gone on to describe the terms in future chapters as and when they have been encountered and the need for their explanation has arisen. So the reader is not burdened by reading things that he might feel are not relevant to him.

Stephen W. Hawking in his *A brief history of time* says someone told him that each equation included in his book would halve the sales. There are a lot of equations in this book and the author feels apologetic for it because of the reference cited above. With due respect to Stephen W. Hawking I presume (my presumptions and predictions have been proved horribly wrong earlier) that applying this principle would mean that no book of physics and mathematics would ever be sold and that would mean that Prof. Hawking would not have been what he is today. So I think the inclusion of all these equations is an integral part of this book without which the book would not have been what it is now.

The chapter on the historical background of ballistics and their development is highly informative. Its utility is all the more relevant in a third world country like India (where I reside) as the developments being made in the developed countries reach here at least a decade late if not more. So we do encounter those outdated guns and missiles in our daily practice that are no more used in the western nations. The description of the various international treaties tells us both the utility and the futility of these treaties.

A good thing that I noticed in this book was the use of examples. Every time the authors have described something new, they have given a suitable that too by giving their usage in ballistics. Many times it is seen that examples are given but they are totally out of context. In this book nothing of that sort has happened. Also photographs have been put as and when they are required. The photograph on page 110 regarding special mention. This photograph describes 'gas flow at a muzzle having just fired a shot'. It describes what the author wants to say clearly and in great detail. One thing that I found absent here was the technique of taking such a photograph so that we can use it at our institute.

An important feature of this book has been its ability in dispelling misconceptions. I would like to give just a couple of examples. Firstly the authors have shown that the wounds caused by ballistics are not sterile (page 184). This they have done both by showing it mathematically and experimentally. Secondly they have also shown, using the same methods, that the missiles do not cause any burning (another misconception widely prevalent in general public and medical fraternity alike). Another misconception that the authors have tried to dispel is regarding the role of momentum in causing the effects of the missiles. And I must say they have been pretty successful in proving their point. Another aspect that I found has been described beautifully is the difference between effectiveness and effect of missiles (page 240-41). Its relevance lies in the fact that the earlier developments and the future research depends on these points and their difference should be known to all and sundry involved in the R & D of ballistics.

...I would like to say that this is the most comprehensive, up to date, unbiased and scientific description of ballistics that I have come across. This book according to me is a must keep for all those people who deal with ballistics in any way, be that as forensic scientists, forensic pathologists,

crime scene investigators, students, people working in R & D for development of new and more improved designs or the students hoping to be involved in any of these fields...

I am a forensic pathologist. So I have a basic idea about the properties of ballistics. I do know the various types of guns and projectiles. I am aware how the mass and velocity of the projectile affect its effect. I also know about the range of missiles, their caliber, their penetrating power etc. But I know all this with respect to their effects on the human body. Also I know them in the form of comparisons i.e. such and such thing is better than the other or that this is more penetrating than the other. I was not aware of the absolute figures about the properties of the guns and the bullets. I was also not aware of their physical and mathematical properties. These are the things that I have learnt from this book.

The only drawback of this book, if I dare call it a drawback, is that at some places one feels that the equations mentioned have been just mentioned and their derivation i.e. how one got them has not been explained. A basic principle in physics is learning by doing. At many places when I encountered a new equation, I wanted to know how that result came. And when I was not able to find an answer in the book, I had to look up at other places. As I have already mentioned about my laziness, I found it a really harrowing experience. So I think a little more of detail in some equations would have been like icing on the cake.

A word about the conversion tables mentioned at the end of the book. These, I think, are the high point of the book. Although these tables can be found in most standard textbooks of physics and mathematics, all of them are usually not seen in a single book. Also the examples and their usage is something that is rarely seen in modern textbooks.

In the end I would like to say that this is the most comprehensive, up to date, unbiased and scientific description of ballistics that I have come across (being a forensic pathologist my experience, although not great, is of some standing). This book according to me is a must keep for all those people who deal with ballistics in any way, be that as forensic scientists, forensic pathologists, crime scene investigators, students, people working in R & D for development of new and more improved designs or the students hoping to be involved in any of these fields.

Before I close just a passing remark about the title of the book. The authors have mentioned that wound ballistics is just a part of terminal ballistics i.e. when the projectile hits the human being. And in this book this aspect covers too little a space for it to be made the title of the book. So I would suggest that the title of the book should be made a bit more appropriate, something that really signifies the real essence of the book.

-Puneet Setia and Avneesh Gupta
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