

1 History of Forensic Medicine

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1.1 Definitions

According to Sydney Smith (1951) forensic medicine may be defined briefly as consisting essentially of that body of medical and paramedical scientific knowledge which may be used for the purposes of administration of the law. Alfred Swaine Taylor has defined medical jurisprudence as 'that science, which teaches the application of every branch of medical knowledge to the purpose of the law'. According to a German definition by Schmidtman (1905), the last editor of the famous *Handbook of Forensic Medicine* by Johann Ludwig Casper (1857), forensic medicine is a cross-sectional discipline of medicine and natural sciences dealing with all medical evidence that is relevant for law. It deals with medical evidence not only in practice but also in research; furthermore, all legal essentials in health care are especially important for doctors as part of their teaching, training and research.

Apart from forensic pathology being the essential branch in the development of forensic medicine, in the last 20 years clinical forensic medicine has developed as its own field of expertise. Clinical forensic medicine is that discipline of medicine which involves an interaction between law, judiciary and police dealing generally with living persons.

There is of course no special date at which forensic medicine emerged as a recognisable separate scientific discipline. Several steps in the development of forensic medicine can be distinguished (Box 1.1): firstly the use of medical knowledge for legal and public purposes, secondly compulsory medical testimony

for the guidance of judges in special cases, and thirdly professionalisation as its own discipline.

Characteristic topics that are dealt with in forensic medicine are summarised in Box 1.2. Forensic medicine as we experience it at the beginning of the 21st century has developed since the 19th century and from much older roots. The famous criminal code of Emperor Charles V, the *Constitutio Criminalis Carolina*, promulgated in 1532, is often called a landmark of the first importance in the history of legal medicine (Fig. 1.1). R. P. Brittain (1965a) wrote:

It has commonly been considered as the true start of legal medicine, and hence Germany has been hailed as the country which gave birth to the discipline. It has been said that it caused medical men to be called in legal matters for the first time. This is not strictly true. They had been called on before as earlier enactments show. Without in any way minimising the advance the Carolina represented, it would be wrong to consider it as a phenomenon which occurred without logical antecedents, and as implying the legal medicine arose by a kind of spontaneous generation.

Indeed the Bamberg Criminal Code was a model for the *Constitutio Criminalis Carolina*. However, there is a deep-seated relationship between medicine and law dating back much earlier. These roots can be found in studies of nature, the violation of law and its relation to medicine (injuries, violent death, pregnancy, still birth, rape, poisoning) and the need for experts

Box 1.1 Development of forensic medicine.**Step 1**

Medical knowledge used for legal or public purposes and dependent on the level of achievement both in law and medicine in:

- Knowledge of medical plants and botany
- Knowledge of injuries
- Educational standards in medicine
- Standards of competency
- Legislation concerning disposal of the dead
- Legislation concerning injuries
- Compensation for injuries and deaths

Step 2

Expert medical testimony must be obtained for the guidance of judges in cases of murder, wounding, poisoning, hanging, drowning, infanticide, abortion and malpractice.

Step 3

Further professionalisation in:

- Medicolegal examination
- Giving evidence at court/medical expertise required at court
- Publication of monographs
- Teaching
- Systematic research (decrease of the domain of magic and sorcery)
- Knowledge gained by own practice replacing textbook knowledge (e.g. J. L. Casper)
- Foundation of professorships
- Foundation of own institutes
- Foundation of societies

to assist the law or a court – thus defining the constitution of forensic medicine as a scientific discipline with the publication of monographs, subjects of special instructions and its own research (Table 1.1).

The development and existence of the speciality of forensic medicine depends essentially on two factors: a sufficiently high development of the law and a sufficiently high development of medicine. As Ackerknecht has outlined, in very highly developed civilisations with sophisticated legal regulations there is, on the one hand, no evidence that judges consult medical persons in assessing crime. On the other hand, despite the high development of a rational medical art, no document exists that provides evidence for the use of medical experts in ancient Greece.

Box 1.2 History of characteristic topics in forensic medicine. After Fischer-Homberger (1983).**Responsibility**

- Age
- Gender
- Mental diseases, melancholia
- Simulation
- Disease or malice

Sexuality and reproduction

- Marriage, family
- Impotence, infertility
- Virginity
- Conception and pregnancy
- Duration of pregnancy
- Superfetation
- Abortion
- Infanticide: hydrostatic tests of the lungs
- Rape

Injuries and violent death

- Injuries
 - prognosis of injuries and their locations
 - lethality of wounds, grades of lethality
 - relative fatality of wounds in different parts of the body
- Suffocation
- Poisoning

Role of medicine for the public

- Specialised medical profession
- Educational standards
- Standards of competency
- Ethical standards
- Malpractice

The early literate civilizations of the Near East and China had definite systems of law relating not only to crime but also to property, marriage and other civil matters. For instance, in Egypt the practice of medicine was subject to legal restrictions; the right to practice was restricted to members of a certain class with the intention that physicians had to study the precepts laid down by their predecessors in certain ancient books (Smith 1951). Since physicians had to strictly adhere to the knowledge of ancient books, experiments and originality were not encouraged and, instead, witchcraft, magic and sorcery became dominant. As a result good treatment was characterised by observing the authoritative ‘canon’, with the result that bad treatment or even malpractice originated from not properly observing the authoritative ‘canon’.

In China at the beginning of the 14th century, a noteworthy volume entitled *Hsi Yüan Lu* (*The washing way of wrongs*) was compiled on the procedure to be followed in investigating deaths, especially those under suspicious or obviously criminal circumstances. Sydney Smith, who has studied a comparatively modern edition of this book, describes his impression as follows:

1.2 Civilisations of the Near East and China

Forensic medicine developed in relation to law and it was often legal requirements that pushed improvements in forensic medicine forward. Forensic medicine as a scientific discipline developed when the domain of magic and sorcery was overcome.



Figure 1.1 *Constitutio Criminalis Carolina* (criminal code of Emperor Charles V). Reproduced from [http://commons.wikimedia.org/wiki/File:De_Constitutio_criminalis_Carolina_\(1577\)_13.jpg](http://commons.wikimedia.org/wiki/File:De_Constitutio_criminalis_Carolina_(1577)_13.jpg) (last accessed 12 June 2013).

I have not seen a translation of a really ancient copy of this book, but even from a comparatively modern edition (1843) one certainly gets the impression that there was a comprehensiveness in the scope of medicolegal procedure in ancient China that was not to be found in mediaeval Europe. The importance of a satisfactory examination of the wounds on a body is stressed, among other reasons, in order to check the validity of a confession or other statement. The sites where wounding is likely to prove mortal are indicated. The preparations necessary for the examination of a body are described, and the examiner is warned not to be deterred by the unpleasant state of the corpse, but to make a systematic examination from the head downwards in every case. The difficulties caused by decomposition are clearly recognised, and the examiner is advised on the subject of counterfeited wounds. Sections are devoted to wounds caused by different agencies, such as blows from the fist or kicking, by various types of weapon, etc.; and to asphyxial deaths – f.i. by strangulation and drowning. The possibility of homicidal strangulation being passed off as suicide is discussed, also the means for distinguishing between the bodies of drowned persons and those thrown in after death. The possible confusion between ante-mortem and post-mortem burning is recognised, and poisoning is given considerable attention. The examiner is advised on the possible importance of examining the locus, and is

Table 1.1 Timetable of the history of forensic medicine.

Date	Place/person	Events
3000 BC	China	Writings about pharmacology and pharmacognosy
1700 BC	Babylon	Code Hammurabi: rights and duties of physicians including medical malpractice
220 BC	China	Bamboo texts with information on the rules and regulations for the examination of injuries
10 BC	India	Law of Manu: competence of witnesses at court
-	Egypt	Detailed laws concerning the medical profession and forensic medical investigation; stab wounds were categorised and closed head injuries with fractures described
-	Persia	Official code for medical fees, penalties for medical malpractice, and classification of injuries; abortion was classified as a crime
-	Greece	Autopsies on human bodies were not permitted; use of physicians as expert witnesses was loose and ill defined
572 BC	Lex Aquillia	Lethality of wounds, ' <i>novus actus intervenium</i> ', break in causation
460-355 BC	Hippocrates of Kos	Lethality of wounds; Hippocratic oath as basis of medical ethics
449 BC	Rome	<i>Lex duodecimo tabularum</i> : length of gestation (for the determination of legitimacy), disposal of the dead, poisoning, and punishment depending on the degree of injury
Ancient Rome	Numa Pompilius	Advocated cutting open the bodies of pregnant women after death to deliver the baby (Caesarian section)

(Continued)

Table 1.1 (Continued)

Date	Place/person	Events
138-78 BC	Lex Cornelia (Sulla)	If a physician caused the death of his patient he should be exiled or executed; prostitution and confinements supervised
100-44 BC	Gaius Julius Caesar	A body was examined after murder by the physician Antistius who discovered 23 stab wounds and declared only one to be fatal
23-79 BC	Plinius the Elder	Complained that laws punishing incompetent or ignorant physicians were needed; also discussed drowning
AD 131-200	Galen	Dealt with gladiators and their wounds, anatomical features, differences between neonatal and adult lungs, stillbirths (<i>rubra, gravis, densa substantia carnis pulmonum</i>) and live births (<i>alba, levis, rara substantia carnis pulmonum</i>)
483-565	Justinian	'Physicians are not ordinary witnesses, but give judgement rather than testimony' (<i>Medici non sunt proprietestes sed maius est iudicium quam testimonium</i>); discussed proof of pregnancy, sterility, hermaphroditism and simulation of diseases
5th-10th centuries	<i>Leges barbarorum</i> <i>Lex euricianus</i> <i>Lex visigothorum</i> <i>Lex burgundionum</i> <i>Pactus legis salicae</i> <i>Pactus legis riduarie</i> <i>Edictus rothari</i> <i>Pactus legis alla manorum</i>	Consisted of the Goths, Visigoths and Vandals; when medical experts have to be called; 'wergeld' (blood money) had to be paid to the victim of the perpetrator or to relatives of the decedents; description of wounds
742-814	Charlemagne	Capitularies: expert medical testimony required in cases of wounding, abortion, rape, incest, infanticide and suicide
1100	Assizes of Jerusalem Godfrey de Bouillon	In cases of alleged illness or murder three experts were sent
1140	Roger II of Sicily Frederic II	Physicians required to have an examination prior to commencing their practice Public examination of physicians, strict criteria for medical practice, and versed in the teaching of Hippocrates and Galen; requirements for ordination as a doctor: at least 21 years of age, legitimately born, have studied logic for 3 years, have studied medicine for 5 years, served 1 year of apprenticeship On qualification had to swear an oath to treat the poor free and visit each of his patients twice by day and once by night as required A human body should be dissected in public once every 5 years
1209	Pope Innocent III	Appointment of physicians to the courts
1234	Pope Gregory IX	<i>Compilatio decretalium</i> : collection of all decisions and edicts related to medicolegal matters
1507		Bamberg penal code: medical evidence necessary in certain cases
1532	Charles V	<i>Constitutio criminalis Carolina</i> ; legal medicine originated as its own speciality; requirement of a medical opinion in cases of murder, wounding, poisoning, hanging, drowning, infanticide or abortion
1575	Ambroise Pare Codronchius Fortunatus Fidelis	Wrote book on medicolegal reports, death from lightning, ante- vs. postmortem injuries, and poisoning by carbon monoxide <i>Methodus testificandi</i> <i>De relationibus medicorum</i>
1584-1659	Paolo Zacchia	<i>Questiones medicolegalis</i>

warned that at an inquest nothing should be regarded as unimportant. . . . Altogether it is a remarkable document, and, although some of the methods and tests described are fantastic, there is no doubt that the real nature of the problems involved was clearly appreciated. As I have suggested, it is unfortunate that I cannot with certainty sort out the genuinely ancient from the more modern interpolations, but I am left with the conviction that in mediaeval times Chinese forensic medicine was far in advance of contemporary European practice. (Smith 1951)

1.3 Justinian enactments

The Justinian enactments between AD 529 and 564 represent, according to Sydney Smith, the highest point of achievement in forensic medicine in the ancient world. Amongst many other things the Justinian Code provided guidelines for the regulation of the practice of medicine, surgery and midwifery; for the proof of competence by means of examinations; for the classes of physicians that were to be recognised; for the limitation of the number of physicians in each town; and for the penalties to be imposed for malpractice. The Justinian laws clearly recognised and defined an integrated medical profession, with required educational standards and standards of competency, in a way that had never previously been achieved. The medical expert, defined as '*Medici non sunt proprie testes, sed majus est iudicium quam testimonium*', was not an ordinary witness, appearing for one side or for the other side, but assisted the judiciary by impartial interpretation. The Justinian Code enjoined the cooperation of medical experts in a broad field of legal problems, for instance in the determination of the existence of pregnancy, in cases involving sterility, impotence or legitimacy, in cases of rape, in cases of poisoning, in cases involving the problem of survivorship, in cases which were complicated by the question of mental disease, and in other comparable circumstances (Smith 1951).

1.4 Further developments and Italian town charters

In the 12th century physicians were already being used as experts in cases of alleged illness or injuries. In the so-called Assizes of Jerusalem from 1100 it was determined that if, because of alleged illness, a vassal could not appear before the lords' court to plead his case, the lord must send to this man's house three office men to decide on the issue – a physician, an apothecary and a surgeon. In cases of murder these three experts were also sent, and they had to say what was the matter with him (the body), where he had been injured and with what instrument it seemed to them that the injuries had been inflicted. Similar regulations existed at the same time in Antioch:

Box 1.3 Dates of the foundation of some European universities.

- Parma 1066
- Bologna 1119
- Modena 1175
- Perugia 1200
- Paris 1211
- Padua 1222
- Naples 1224
- Sienna 1240
- Montpellier 1289
- Prague 1348
- Jena 1365
- Heidelberg 1386
- Cologne 1388
- Leipzig 1409

knights could only excuse their non-attendance before the court when medical experts confirmed an alleged illness (Bonte 2000).

The Italian town charters played an important role from the 11th to 13th century. The town charters were qualified with the help of the law faculties in the newly established universities (Box 1.3). For instance, in the town of Bologna, Hugo de Lucca was appointed expert of the magistrate of the city. It is likely that he was the first to perform legal autopsies between 1266 and 1275. Most of the Italian town charters determined that two experts, generally a physician and a surgeon, were responsible for postmortem examinations. An example of such an early report by medical experts is:

Bologna 1289

Master Albertus Maledova and Master Amoretus, physicians, who, on the injunction of Albertus of Gandino, judge, have seen and examined Jacobus Rustighelli in the Church of St. Catherine of Saracocia, wounded and dead, state in concordance, after having seen and examined, to have found the following:

in the thorax: seven deadly wounds

in the neck: one deadly wound

in the middle of the forehead: two deadly wounds

in the occiput: one deadly wound

in the upper jaw: one non-fatal wound

Sworn to be true on Saturday, February 12th. (Ackerknecht 1950/51)

In Bologna, according to the town charter a medical expert must be at least 40 years of age and to have been a citizen of Bologna for at least 10 years. The first documented legal autopsy report of Bologna was signed by Bartolomeo da Virignana in 1302.

The right of performing an autopsy was given to medical faculties, such as the faculty of medicine of the University of Montpellier in 1374. As in Italy, forensic medicine in France

and Germany developed with the foundation of universities and medical faculties. Medical faculties even discussed and criticised court decisions. In 1478 the University of Cologne gave the following advice: 'It is useful and necessary that those who die unexpectedly – god forbid this but unfortunately it happens so often – are opened and dissected immediately in order to examine the organs and find the cause of death or the lethal disease' (Ackerknecht 1950/51). The physicians knew the limitations of only examining a body, they were aware of their responsibility. In the 17th century in particular it was recognised that autopsies were necessary to definitely clarify the cause of death, even if no signs of external violence were visible. Gottfried Welsch (1618–1690) in the first edition of his book *Rationale Vulnerum Lethalium Judicium* (1660) was already rec-

ommending forensic autopsies, especially in cases of intoxication, and that autopsies should be performed by doctors with experience in postmortem dissection.

1.5 Forensic medicine as a book science

The period from the late 16th to 18th century was characterised by books published on forensic medicine (Box 1.4). In 1575 Ambroise Paré published a book that dealt with medicolegal reports in 'Death from wounds or impotence or loss of any member'. He discussed abortion, infanticide, death by light-

Box 1.4 Important books in the history of forensic medicine (17th–18th centuries).

- ALBERTI, Michael: *Systema jurisprudentiae medicae . . . cum praefatione*. Foreword by Christiani Thomasii: *Halae: Orphanotropeu* 1725 (Vol. I). Fulda: Tomus alter Schneebergae, 1729.
- AMBROISE, Paré: *Wund Artzney oder Artzneyspiegell. Von Petro Uffenbach . . . auss der Lateinischen Edition Jacobi Guillemeau . . . in die Teutsche Sprach . . . gesetzt*. Frankfurt/M. Fischer: Rötell (Drucker), 1635.
- AMMANN, Paulus: *Medicina critica*. Erfurti: Ohler; Hertz (Drucker), 1670.
- AMMANN, Paulus: *Praxis vulnerum lethalium*. Francofurti: Gleditsch, 1690.
- BOHN, Johannes: *De renunciatione vulnerum, seu vulnerum lethalium examen*. Lipsiae: Gleditsch; Fleischer (Drucker), 1689 (2nd edn, Amsterdam, 1710).
- BOHN, Johannes: *De officio medici duplici, clinici nimirum ac forensis*. Lipsiae: Gleditsch, 1704.
- CARDANUS, Hieronymus: *De venensis libri tres*. In: *Opera omnia*, 10 vols, Vol. 7, pp. 275–355. Lugduni: Huguetau and Ravaud, 1663.
- CASTRO, Rodericus A.: *Medicus-politicus. Sive de officiis medico-politicis tractatus*. Hamburgi: Frobenius, 1614.
- CODRONCHIUS, Baptista: *De morbis veneficis ac veneficijis*. Venetiis: De Franciscis, 1595.
- CODRONCHIUS, Baptista: *Methodus testificandi*. In: *De vitiis vocis, libri duo*, pp. 148–232. Francofurti: Wechel, 1597.
- FAHNER, Johann Christoph: *Vollständiges System der gerichtlichen Arzneikunde. Ein Handbuch für Richter und gerichtliche Ärzte*, 2 vols. Stendal: Franzen and Grosse, 1795, 1797.
- FIDELIS, Fortunatus: *De relationibus medicorum libri quatuor, In quibus ea omnia, quae in forensibus, ac publicis causis, medici referre solent, plenissime traduntur*. Translated by Paul Amman. Lipsiae: Tarnov, 1674 (1st edn, Palermo, 1602).
- FRANK, Johann Peter: *System einer vollständigen medicinischen Polizey*, 4 vols. Vol. 1 (2nd edn), Mannheim: Schwan, 1784 (1st edn, 1779); Vols 2–4 (1st edn), Mannheim: Schwan, 1780–1788; Vol. 5, Tübingen: Cotta, 1813; Vol. 6 (in three parts), Vienna, 1817–1819. The supplements were edited by 1827.
- HALLER, Albrecht von: *Vorlesungen über die gerichtliche Arzneiwissenschaft. Aus einer nachgelassenen lateinischen Handschrift übersetzt*, 2 vols. Bern: Neue typographische Gesellschaft, 1782, 1784.
- MENDE, Ludwig Julius Caspar: *Kurze Geschichte der gerichtlichen Medizin*. In: *Ausführliches Handbuch der gerichtlichen Medizin*, Part 1, pp. 1–474. Leipzig: Dyk, 1819.
- METZGER, Johann Daniel: *Kurzgefasstes System der gerichtlichen Arzneiwissenschaft*. Königsberg/Leipzig: Hartung, 1793.
- PLATNER, Ernst: *Untersuchungen über einige Hauptcapitel der gerichtlichen Arzei-Wissenschaft durch beigefügt zahlreiche Gutachten der Leipziger medicinischen facultät erläutert. Aus dem Lateinischen übers.* Edited by C.E. Hedrich. Leipzig: Kupper, 1820.
- PLENK, Josephus Jacobus: *Anfangsgründe der gerichtlichen Arzneywissenschaft und Wundartzneykunst. Aus dem Lat.* Translated by F. August von Wasserberg. Wien: Gräffer, 1782.
- PLOUCQUET, Wilhelm Gottfried: *Abhandlung über die gewaltsame Todesarten, nebst einem Anhang von dem geflissentlichen Missgebühren. Als ein Beytrag zu der medicinischen Rechtsgelahrtheit*. Tübingen: Berger. No date.
- PYL, Johann Theodor (ed.): *Aufsätze und Beobachtungen aus der gerichtlichen Arzeneywissenschaft*. Collections 1–8. Berlin: Mylius, 1783–1793.
- SUEVUS, Bernhardus: *Tractatus de inspectione vulnerum lethalium et sanabilium praecipuarum partium corporis humani. Variis cum veterum, tum recentium medicorum observationibus, exemplis atque controversiis illustratus, non minus iurisconsultis quam medicis utilis atque necessarius*. Marpurgi: Chemlin, 1629.
- TEICHMEYERUS, Hermannus Fridericus: *Institutiones medicinae legalis vel forensis*. Ienae: Bielke, 1723 (2nd edn, 1731).
- WELSCH, Gottfried: *Rationale vulnerum lethalium judicium, in quo de vulnerum lethalium natura, et causis; legitima item eorundem inspectione, ac aliis circa hanc materiam scitu dignis juxta, quam necessariis, agitur*. Lipsiae: Ritzsche, 1660.
- ZACCHIAS, Paulus: *Quaestiones medico-legales. In quibus eae materiae medicae, quae ad legales facultates videntur pertinere, proponuntur, pertractantur, resolvuntur. Opus, iurispertis apprime necessarium, medicis perutile, caeteris non injucundum*. Ed. Tertia (3rd edn), Amstelaedami: Blaeu, 1651 (1st edn, Rome, Vol. 1, 1621; Vol. 2, 1625; Vols 3–4, 1628; Vol. 5, 1630; Vol. 6, 1634; Vol. 7, 1635).

ning, hanging, drowning, feigned diseases and the differentiation of ante- and postmortem wounds – all topics that still belong today to the field of forensic medicine. He also dealt with poisoning by carbon monoxide. An example of a report by Ambroise Paré on an abdominal wound resulting in abortion is as follows:

I, Ambroise Paré, have come on the order of the great Provost to the Rue St. Houbré, to the house of Mr. M., where I have found a lady called Margaret in bed with a high fever, convulsions, and haemorrhage from her natural parts, as consequence of a wound that she has received in the lower abdomen situated three fingers below the umbilicus, in the right part, which has penetrated into the cavity, wounded and penetrated the uterus. She has therefore delivered before term a male infant, dead, well formed in all its limbs, which infant has also received a wound in its head, penetrating into the substance of the brain. Therefore the above-mentioned lady will soon die. Certified this to be true in putting my signature, etc.

In 1597 Codronchius, a physician of Imola, published his important *Methodus testificandi*, in which he dealt with wounds, poisoning and sexual matters and gave models of reports. Another magnum opus was the work by Fortunatus Fidelis of Palermo entitled *De relationibus medicorum*, which was the first great general systematic treatise on legal medicine. In this he



Figure 1.2 Paulus Zacchia (1584-1659), called the 'Father of forensic medicine'. Courtesy of the US National Library of Medicine, History of Medicine Division.

deals firstly with matters of public health, secondly with wounds, simulated diseases and medical errors, next with virginity, impotence, pregnancy and viability of the fetus, and finally with life and death, mortality of wounds, suffocation and death by lightning and poisoning.

The greatest work in this early period was the *Quaestiones medico-legales* of Paulus Zacchias, the principal physician to Pope Innocence X and Alexander VII and an expert before the Rota Romana, the papal court of appeal (Fig. 1.2). He published his monumental work between 1621 and 1635 in Rome (Fig. 1.3), with two additional books published in Amsterdam in 1666. The books are divided into parts and these delve into specific questions dealing with: age, pregnancy, superfetation and moles, death during delivery, life, birth and legitimacy, similarity and dissimilarity of children to their parents, dementia and insanity, poison and poisoning, impotence, feigned

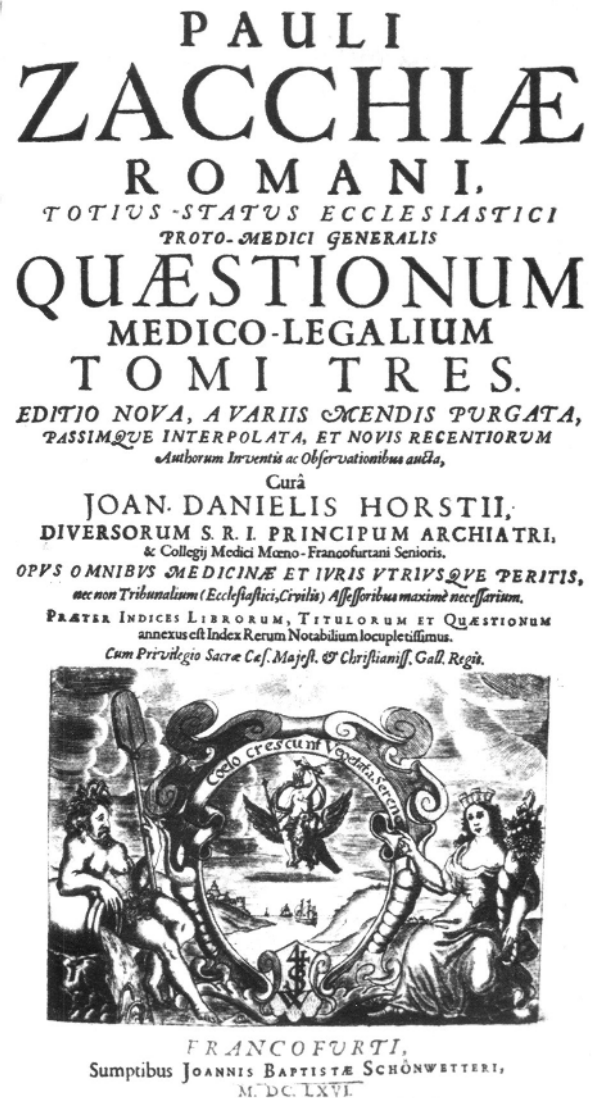


Figure 1.3 Title cover of Paulus Zacchias's book *Quaestiones medico-legales*.

diseases, the plague and contagion, miracles, virginity and rape, fasting, wounds, mutilation, and the salubrity of the air, water and places. Thus by the middle of the 17th century there was a well-developed literature on this subject and the subject itself was recognised as an entity.

In the 17th and early 18th centuries it was mainly professors at universities in mid Germany (at Leipzig and Halle) who contributed to the development of forensic medicine. In 1660 Welsch (at Leipzig) wrote a book on wounds, dealing with their vitality. Ten years later Ammann (also from Leipzig) produced a manuscript dealing with false beliefs in forensic medicine and in 1690 a more important contribution, his treatise on fatal wounding. In 1689, Johannes Bohn of Leipzig published his work *De renunciatione vulnerum*, which was of great importance at his time, and distinguished ante- and postmortem wounds and wounds deadly per se (*per se seu absolute lethalia*) from accidental factors (*ca accidenc lethalia*). He was in favour of complete medicolegal autopsies instead of wound inspection and described procedures to be followed. According to Bohn, in Germany, there was during the 18th century an almost uninterrupted production of treatises on legal medicine. However, in the 18th century forensic medicine was a 'book science'.

It was during the 19th century that this book knowledge was replaced by personal experiences. Johann Ludwig Casper (1796–1864) worked for nearly 40 years in the area of forensic medicine in Berlin. He transformed forensic medicine into a useful speciality based upon practical experiences and personal observations. His classic textbook *Praktisches Handbuch der Gerichtlichen Medizin* (1856) was based on his extensive practical experience. Centres of legal medicine as it became a modern science in the 19th century were located in Berlin, Vienna, Glasgow, Edinburgh and London.

1.6 Forensic medicine as an experimental science

1.6.1 France

According to Bertrand Ludes (2008), modern forensic medicine was born in France during the French Revolution with the closure of old universities and the creation of three new faculties of medicine in Paris, Strasbourg and Montpellier. Medical studies were reorganised in 1794 and professorships of forensic medicine were established in the new faculties. For instance, in 1789 Francois Emanuele Fodere (1764–1835) published his legislation enlightened by physical sciences, and treatises of forensic medicine in public health, which represented the first French publication with forensic medicine in its title. Fodere distinguished between civil forensic medicine, criminal forensic medicine, administrative forensic medicine or public health, and health and medicine policing. He held the chair of forensic medicine in public health in Strasbourg where he published in 1830 a new edition of this treatise. He defined forensic medicine



Figure 1.4 Mathieu-Joseph Bonaventura-Orfila (1786–1853).

as follows: 'By forensic medicine one means the application of physical, natural and medical knowledge to the legislation of the people, the administering of justice, local government, the maintenance of public health'.

New horizons were opened for forensic medicine with the development of pathological anatomy and analytical toxicology, both vigorously promoted by Mathieu-Joseph Bonaventura-Orfila (1786–1853) (Fig. 1.4), one of the most influential men in the development of scientific forensic medicine in France. A born Spaniard, Orfila was physician to Louis XVIII and dean of the Paris faculty from 1830 to 1848. He published famous books such as his *Tread de Toxicology* (1813) or *Leson de Medicin Legal* (1823) and did experimental work both in toxicology and classic forensic medicine, including on putrefaction and post-mortem wounds. By 1840 Orfila was able to use a test that has coined almost a whole branch of crime: the arsenic test of J. Marsh (1795–1846) of 1836. According to Brouardel there was a dramatic decline of poisoning trials in the decade 1830–1840 due to the Marsh test. Orfila was not only a brilliant scientist and teacher but also a 'courtroom star'. Further famous forensic scientists were Alphonse Divergy (1798–1879), author of a monumental treatise in 1853, P. C. H. Brouardel (1837–1902) and Ambroise Auguste Tardieu (1818–1879), who was a pupil of Orfila and like his master a courtroom star. They no longer produced 'treatises', but special monographs on particular issues such as hanging, abortion, poisoning, wounds, etc. Tardieu wrote the first book on sexual abuse in children and on battered children; subpleural haemorrhages are named after him. Brouardel held the chair of forensic medicine in Paris between 1879 and 1896 and also became dean of the faculty of medicine. In Lyon, forensic medicine was developed by



Figure 1.5 Johann Ludwig Casper (1796–1864), founder of modern forensic medicine in Prussia.

Alexandre Lacassagne (1843–1924), who held the chair of forensic medicine in the faculty of medicine for over 30 years (1880–1913).

1.6.2 Prussia

One of the most remarkable experts in forensic medicine in the 19th century was Johann Ludwig Casper the founder of modern forensic medicine in Prussia (Fig. 1.5). He was born in Berlin in 1796 and died there in 1864. Casper studied medicine in Berlin, Göttingen and Halle and became a medical doctor in 1819. At the age of 24 he had already received his postdoctoral lecture qualification for pathology and legal medicine. After his graduation he studied private and state institutions for public health in England and France for a year and in 1825 he was appointed a private counsel and member of the Royal Medical Council of Brandenburg. From 1834 on he was senior private counsel of medicine and a member of the scientific deputation for health care. In 1839 he was appointed professor and medicolegal officer for Berlin and in 1850 director of the Institute of Forensic Medicine, at that time called *Unterrichtsanstalt für Staatsarzneikunde* (School for State Medicine). Casper published more than 170 papers, some at the beginning of his career on medical statistics. He published on mortality and life expectancy with regard to different countries, gender and busi-

nesses (e.g. the mean life expectancy at this time was 38.5 years in England and only 21.3 years in Russia; the mean life expectancy for theologians was 65.1 years and 50.8 years for medical doctors). In 1852 Casper founded the quarterly *Journal of Forensic and Public Medicine* and in 1857 the first edition of his practical handbook of forensic medicine was published. His practical handbook, which was also translated into English, was revolutionary since its content was based on his own observations. His motto was '*Non hypotheses condo, non optiones vendito, quod vidi scripsi*'. In the preface of his handbook he wrote:

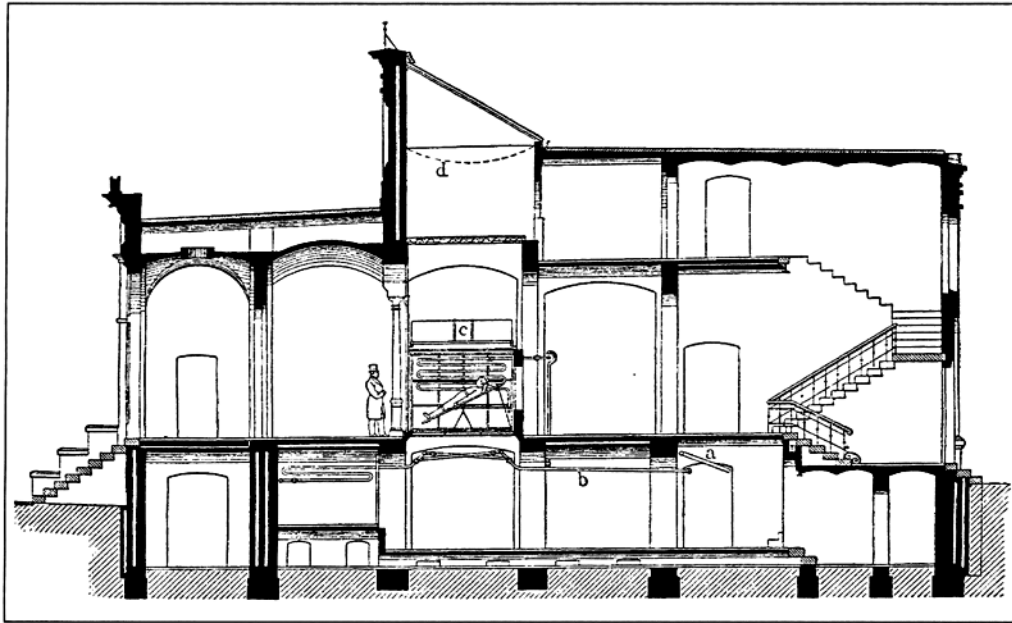
In this book as in all my lectures in the last thirty-six years I have striven especially against the prime failing of most authors on forensic medicine, viz., the separation of it from general medicine, and have endeavoured to purify it from all irrelevant rubbish, which has been so copiously accumulated in it by tradition, want of experience in forensic matters, and therefore of the proper relation which the medical jurist bears to the judge, as well as mistaken ideas as to the practical object of the science. . . .

The correct appreciation of a simple dogma, which is unquestionably correct as it is to be unalterably maintained, leads of itself to the necessary reform in treating of juridical medicine. I mean the dogma that a medical jurist is – a *physician* – nothing more, nothing less, nothing else, and, as this simple dogma has been grossly misunderstood, to make it still more plain, I again repeat, he is a *physician*, and not a lawyer etc. Just as a technologist, artist, or any other craftsman must hold his knowledge or experience in his art or trade at the service of justice in the interest of the common need, so must the physician, and nothing else is required of him. . . .

This erroneous blending of medical and legal ideas and objects is also combined with another greater and more consequential error in the practice of forensic medicine. I mean the tendency to endeavour to obtain strict apodictical proof, such as was required by the practice of the older penal courts. . . . I demand in what other branch of general medical diagnosis, of which the forensic is but a part, is such indubitable certainty required, or where can it be attained?

(Johann Ludwig Casper, preface to the third edition of his textbook, 1860)

His practical handbook achieved eight editions, the last of them published by Schmidtman in 1905. Casper also published an *Atlas of Forensic Medicine*. His son-in-law was his successor as head of the *Unterrichtsanstalt für Staatsarzneikunde* and built in Berlin the famous Institute of Forensic Medicine at the Charité from 1884 to 1886 (Fig. 1.6). Liman had visited



Schnitt durch die Gebäudemitte

Figure 1.6 Cut-through of the Institute of Forensic Medicine at the University of Berlin (built from 1884 to 1886). The institute served also as a morgue where unidentified deceased people were exhibited for public viewing. At the first floor a man is standing in front of a glass window, behind the window bodies are exhibited in cooling cells. The Paris morgue served as a model for the construction of the morgue in Berlin.

the Paris morgue and the plans for the institute in Berlin were based on the building in Paris.

1.6.3 Austria

In Vienna an institute of forensic medicine had been founded by 1804 as the Institute of Forensic Pharmacology and Medical Police. The claim of having a medical police goes back to Johann Peter Frank, who was appointed professor of surgery at the University of Vienna in 1794. His most famous book was *System einer vollständigen medizinischen Polizey* (*System of Complete Medical Police*). However, from 1844 to 1875, forensic autopsies were performed by pathologists, mainly by the famous pathologist Carl von Rokitansky. In 1875, Eduard von Hofmann, who was the first professor of forensic medicine at the University of Innsbruck (since 1869), moved to Vienna (Fig. 1.7). In 1878 he published his famous *Lehrbuch der Gerichtlichen Medizin* (*Textbook of Forensic Medicine*), which was translated into four languages (French, Russian, Italian and Spanish) (Fig. 1.8). The 11th edition of this textbook was published by his pupil Albin Haberda in 1922. Around this time Johann Peter Frank founded a museum of biological specimens in Vienna which can still be visited today in the so-called 'Narrenturm'. Von Hofmann moved the forensic preparations out of the Museum of Pathology and founded his own collection of forensic preparations, which now comprises more than 2000 preparations; preparations are still exhibited that appeared in his own textbook and atlas of forensic medicine.

1.6.4 United Kingdom

In the UK the development of forensic medicine lagged behind Italy, France and Germany due to differences in legal systems and practices. In contrast to English common law, the approach of Roman canon law to legal decision making encouraged the development of forensic medicine because, according to Vanezis, technical evidence by experts could be more easily incorporated as sentences were made by judges. This contrasts with common law trials where the use of juries tended to discourage testimony that could not easily be understood by lay people. However, by the end of the 18th century, chairs of forensic medicine were founded in Edinburgh and Glasgow. By 1834, 37 medical schools in Great Britain provided courses of instruction in forensic medicine. The course subjects had been made obligatory for the medical curriculum of every medical school the year before. The rise and decline of forensic medicine in the UK is entwined with the incorporation of forensic medicine into the medical curriculum. By 1944, the instruction in forensic medicine given to medical students was excessive. However, later, the Royal Commission on Medical Education in 1968 did not consider the subject at all. As a consequence, universities could claim with considerable justification that the provision of forensic medicine as a speciality of its own was not important, particularly when money was short and virtually no research came from those who specialised in the subject.

A decline of academic forensic medicine has not only been observed in the UK but also in Germany. Reasons for this are an inadequate financing of forensic medicine, competition for



Figure 1.7 Eduard von Hofmann (1837–1887), professor of forensic medicine in Vienna from 1875 to 1887. His time in Vienna is called the golden age of forensic medicine. He published not only a famous textbook and an atlas of forensic medicine, but numerous articles throughout the whole discipline. He had many important pupils who performed outstanding experimental research.

money between different medical disciplines and a scientific recognition that is based on impact factors and external funding.

1.7 Current problems

Forensic medicine developed as a recognisable separate scientific discipline in most European countries in the 19th century but was not considered to be a separate academic discipline. More than 100 years ago, the famous German surgeon Theodor Billroth (1826–1894) wrote in a book on teaching and learning medicine at German-speaking universities (1876) that there is no need to teach forensic medicine at universities since it is not a science on its own but rather a compilation of other independent sciences, and that the knowledge of these sciences is only used for practical purposes (e.g. judicial questions). This approach is not only wrong but has also proved hard to dispel and has accompanied our discipline for more than a century. In England and Wales the number of professorships in forensic medicine has decreased dramatically, and in Germany several institutes of forensic medicine have closed in the last 10 years.

Forensic medicine, however, does have its own research profile and deals with questions and issues that are not found in other disciplines. These include:

- Thanatology: postmortem changes, time of death, wound age estimation, distinction between ante- and postmortem injuries and vitality of wounds.
- Traumatology as a basis of reconstruction.
- Postmortem toxicology.
- Toxicological analysis of various body fluids.
- Hair analysis.
- Driving under the influence of alcohol or drugs and impaired driving ability.
- Stain analysis.

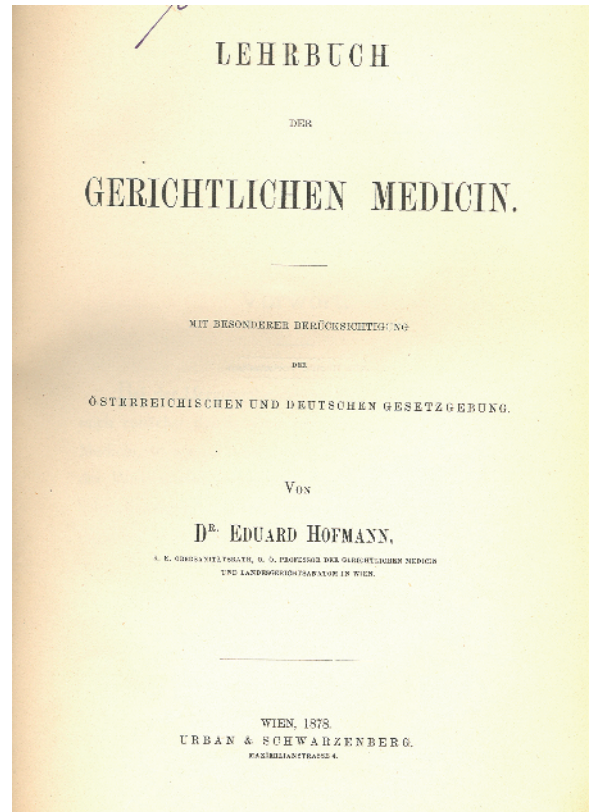


Figure 1.8 Title cover of Eduard von Hofmann's *Textbook of Forensic Medicine*.

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