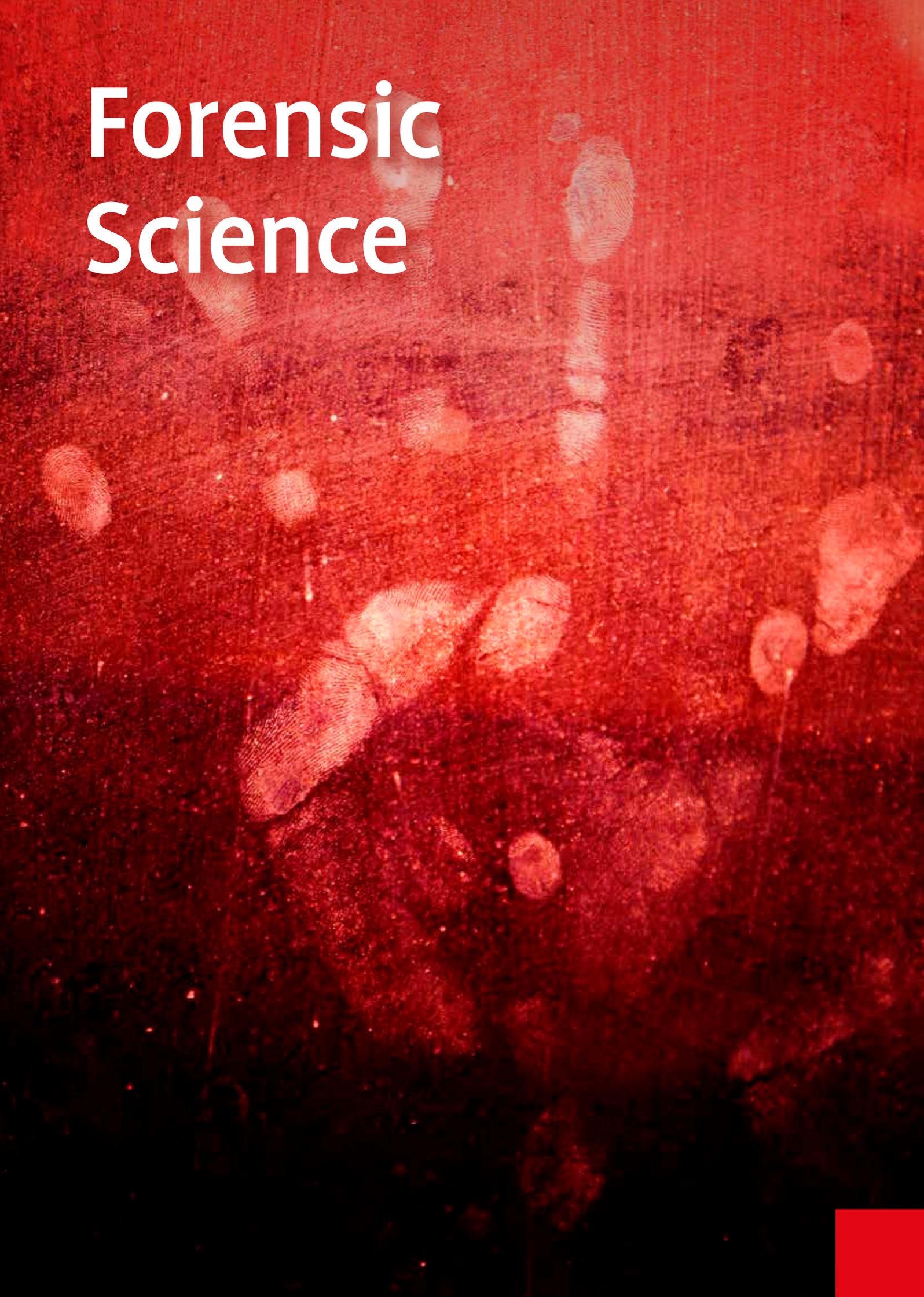


Forensic Science

The background of the image is a dark, textured red surface, possibly a book cover or a piece of fabric. It is covered with numerous faint, overlapping fingerprints of various sizes and orientations. The fingerprints are light in color, contrasting with the dark red background. The overall appearance is that of a heavily handled or touched surface, which is a common theme in forensic science.

The FORENSIC SCIENCE programme trains professionals who investigate the facts of a crime or incident. They help to solve a crime or incident with the aid of scientific, digital, investigation and detection techniques.



Forensic analysts and investigators work in all kinds of professions where the question of cause or guilt must be established. This involves not only crimes, but also incidents such as fire, fraud, accidents, or damage caused by the failure of products, materials, constructions or human actions. A forensic investigator can therefore work at an 'incident scene' or 'crime scene', but also in analytical, medical or forensic laboratories. In the legal profession or insurance industry, a forensic investigator will often act as an advisor or policy officer. In addition, forensic investigators make an innovative contribution to the field by developing new methods and techniques and/or applying existing techniques in a different context (forensic engineering). In all cases, forensic investigators are able to use their knowledge of natural sciences, investigative techniques and technology to help establish the circumstances of a crime or incident and who is (or is not) responsible for it.

Occupations, positions and roles of the Bachelor can be found in the following professional domains (for a full description of the professional domains, see Chapter 2). The professional field can be defined in 'classic' FS professions, in which forensic investigation plays a key part. Growth in the field of forensic engineering is particularly rapid. Since a detailed definition of the posts in which forensic investigators work would lead to too narrow a definition of the developing professional field, we are not attempting to do so for the time being.

Institutions that offer the programme

- Amsterdam University of Applied Sciences
- Saxion University of Applied Sciences, Enschede

Research and development

- Forensic (digital) specialist, (research) analyst or digital investigator (with the National Police, ECFO, the NFI or, for example, the NVWA)

Application and production

- Forensic crime scene investigator (operational specialist) (with the National Police)

Medical laboratory diagnostics

- Research analyst (chemical or biological) in the lab (e.g. NFI or Sanguin)

Engineering and manufacturing

- Forensic engineer, fire investigator or failure analyst (at various engineering firms)

Commercial and services sector

- Private investigator, commercial advisor or investigator (with insurance companies, in the legal profession or for one of the Dutch security regions)

KENMERKENDE STUDIEBOEKEN

- *An Introduction to Forensic Genetics*, W. Goodwin, A. Linacre e.a.
- *Essential Forensic Biology*, A. Gunn
- *Forensic Chemistry*, S. Bell
- *Fundamentals of General, Organic, and Biological Chemistry*, J.E. McMurry, D.S. Ballantine
- *Principles of Forensic Toxicology*, B.S. Levine, S. Karrigan
- *Shooting Incident Reconstruction*, M.G. Haag
- *Forensic Science*, A.R.W. Jackson, J.M. Jackson
- *Introductory Statistics For Forensic Scientists*, D. Lucy
- *Seeley's Essentials of Anatomy and Physiology*, C. Vanputte, J. Regan e.a.

Programme profile

	Competence							
	Research	Experimentation	Development	Management	Advice	Instruction	Leadership	Self-management
Minimum national attainment target adopted for the programme	III	II	II	II	III	I	I	II

The list of typical textbooks serves as an illustration to give an impression of the level at which the subject is taught in the study programme.

KNOWLEDGE

- Biology*
- **Cell biology:** structure and functioning of micro-organisms and cells, metabolism, biomolecules
 - **Molecular biology:** DNA, heredity, DNA sampling and analysis, operating DNA databases
 - **Anatomy/physiology/pathology:** construction and function of skeleton, skin and organ systems, blood, hormone system, consequences of injuries, autopsy
 - **Entomology:** decomposition phases, succession of species on human remains
- Chemistry*
- **Basic chemistry:** atomic engineering, reaction equations, chemical calculations, reactions in water, kinetics, chemical equilibrium
 - **Analytical chemistry:** sample preparation, spectroscopy, chromatography, gunshot residue analysis techniques
 - **Organic chemistry:** nomenclature, functional groups, reaction mechanisms, narcotics
 - **Toxicology:** pharmacokinetics and toxins
 - **Fire and explosion:** chemistry and physics of fire, fire accelerators, flammability limits, reaction heat
- Physics*
- **Mechanics:** laws of motion, braking, collision and deformation
 - **Strength of materials:** strength, moment, load
 - **Ballistics:** determination of range and position, comparative examination of cartridges and projectiles
 - **Optics:** light, imaging, image analysis
 - **Materials science:** strength, fracture, deformation
 - **Heat transfer:** conduction, convection, radiation
- Informatics*
- Computer forensics, data management, networking, internet forensics, cybersecurity, cybercrime
- Statistics*
- Data processing, normal distribution, confidence intervals, testing
 - Using statistics/calculation of probability when determining evidential value
 - Determining the evidential value of DNA analyses (Bayesian statistics)
- Legislation*
- Principles of Dutch law, criminal proceedings, criminal evidence law and substantiation requirements
 - Lawfulness and reliability of the evidence-gathering process (e.g. expert witness in criminal cases)

SKILLS

- **Research skills and systematic approach to problems:** problem analysis, preparing research questions / hypotheses / scenarios (including for establishing the truth), desk research, research planning and implementation
- **Social and communication skills:** empathy, interviewing, collaborating, meeting, written reporting, oral presentation
- **Information skills:** word processing, spreadsheets, drawing software, presentation techniques, digital information searches and research
- **Skills at scene of crime/scene of incident:** using an (objective) description to make a sketch and a photographic record, managing the securing of biological, chemical and physical evidence, interpreting it and investigating how it relates to hypotheses / scenarios
- **Forensic examination techniques:** e.g. dactyloscopy, hair and fibre examination, scratch, impression and shape marks, presumptive tests on biological evidence
- **Identifying, securing and interpreting digital evidence**
- **Bloodstain pattern analysis**
- **Performing or arranging analyses of traces and/or physical evidence in compliance with standards**
- **Using standard laboratory equipment:** performing simple chemical, physical or biological analyses in a laboratory.

The Body of Knowledge and Skills is a summary of graduates' basic knowledge and basic skills which has been prepared by the HBO-programmes in consultation with the professional field. These are obtained during the first two years of education.

Forensic Science Technician Kirsten Kooistra: 'Sometimes people have no idea what we can do for them'

Name: Kirsten Kooistra
Age: 24
Course of study:
Forensic Science
Place of employment:
Fiscal Information and
Investigation Service (FIOD)
Position: Forensic Science
Technician

The aim of **physical match analysis** is to ascertain whether material parts of a certain piece of evidence have ever formed a single unit, e.g. pieces of torn paper or tape.

'At high school, I was good at science subjects. I wanted to do something on the technical side, but had trouble choosing. I found detective work very interesting, liked watching CSI and Bones – it's a cliché, I know. My mentor suggested the Forensic Science programme. I looked into that and was allowed to spend a day at Saxion, in Enschede.

As a young girl, fresh out of high school, I had no idea what to expect from a study programme. I had hoped for more practical work, and that was a bit lacking, but I understand that this is now much more widely available. In my third year, I was able to complete an internship at the police forensic investigation department, a place where I learned so much! There I saw how I could put into practice the things I had learned at university – perhaps the most instructive experience ever. Afterwards, I consciously wanted to do my graduation intern-

ship with another organisation, to see what else the government had to offer, and so I ended up at the FIOD. After graduating, I was able to work there temporarily and was tasked with setting up an accreditation procedure for the forensic investigation laboratory. When a 'real' job became available, I naturally jumped at it! After a year spent working on accreditation, I attended the internal investigation training course. I've been running my own forensics cases since December, but I'm still working on accreditation.

I'm now a Forensic Science Technician. We focus on dactyloscopic examination (fingerprints), sampling and testing of drugs, photography, securing DNA, advice, scene of crime investigation and **physical match analysis**. Other areas of investigation are forwarded to the NFI or other agencies. One of the competences I use on a daily basis is giving **advice**. Investigative teams ask what we can do for them. Sometimes things seem obvious to us, but financial investigators often don't have a technical background and don't know what we can do for them. We are a small team, are well attuned to each other and are a so-called self-managed team. So the **self-management** competence comes in handy!

A colleague and I also take care of the intake. When enquiries come in from investigative teams, I check whether the enquiry is clear, whether the enquiry meets the intake criteria and whether it is sufficient to justify taking on an investigation. If that's the case, I'll put it out to my colleagues and take care of the administration. **Coordination** is therefore another important competence for me.

I would like to grow in my job, gain a lot of experience and try to make the Forensic Investigation team better known within the organisation. Who knows, I might be in charge someday. The most important thing? Enjoying your work and being open to new things. ■





Operational Specialist Jurgen van Eldik: 'A crime scene is actually one big complicated jigsaw puzzle'

'After completing higher secondary education (HAVO) (NT profile) I opted for the Forensic Science programme, because detective work seemed incredibly cool to me. Luckily, the programme turned out to be highly practice-oriented, so that you are well prepared and no day is actually boring – you feel like you are already solving crimes. I was determined to graduate with the police; I felt a clear affinity with the cold case team, so I did my graduation research there.

In my current job as an Operational Specialist, I participate in the forensic investigation, which means that we go to a crime scene – of a murder, for example, or a burglary or fire – and conduct an on-site investigation to establish the truth. At the moment, I'm still in the early stages of my career. Since this job is subject to a lot of rules and legislation, you have to do a lot of internal follow-up training before you can really participate in a call-out. This sometimes requires a lot of patience, because every day you are confronted with one fascinating situation after another, which you consider to be an 'adventure' in which you want to help out.

In principle, all facets of the work had been fully covered in the programme. The lessons were also always linked to a project, in the form of an actual investigation, which made the link with the real world very clear. In practice, the work is more

clearly split between the call-out and the follow-up investigations in the lab. It is, of course, a higher professional (HBO) programme, so the emphasis is placed on the theory behind different methods and the investigations in the lab. In the lab, a graduate will be up to speed almost immediately, but at the crime scene you really need to gain experience to be able to participate. Of course, the knowledge you have obtained during the programme helps enormously.

The competences of **research, development and experimentation** are important in my job. A crime scene is actually one big complicated jigsaw puzzle that you try to solve through investigation. The job is constantly evolving – involving, for example, new techniques for finding and/or securing evidence. You have to stay curious all the time and be able to hang on in there. **Self-management** is important; the police is a large organisation which offers a lot of possibilities, but you have to be assertive and be able to stand your ground.

Over the next few years, I want to gain a lot of practical experience, which is very important in this job. My current position is the best fit for that at the moment, so for now I'm not thinking about anything else. It may not sound very ambitious but, actually, this is simply my dream job! ■

Name: Jurgen van Eldik
Age: 27
Course of study:
Forensic Science
Place of employment:
National Police, Forensic
Investigation, East
Netherlands Unit
Position and responsibilities: Operational Specialist

