IASR
INTERNATIONAL ASSOCIATION OF SCIENTISTS & RESEARCHERS

TMU
MORADABAD
TEERTHANKER MAHAVEER UNIVERSITY
Accredited with NAAC A Grade
12-B Status from UGC

16th IASR INTERNATIONAL CONFERENCE-2025

FORENSIC SCIENCE

eConference Proceedings

In Collaboration with:

SIFS INDIA
Sherlock Institute of Forensic Science India

For more information: www.events.sifs.in | Venue: Online

Overview

The International Association of Scientists and Researchers (IASR) has emerged as a pioneering organization dedicated to disseminating recent research and studies to avid learners and academics, particularly within the field of forensic science. This journey has been significantly bolstered by the steadfast support of the Sherlock Institute of Forensic Science (SIFS India). The field of forensic science has witnessed notable growth in recent decades, owing to the concerted efforts of talented individuals committed to advancing the discipline. SIFS India's pivotal role in supporting IASR has been instrumental in solidifying the prominence of forensic science in India and globally. Through initiatives such as the IASR International Conferences, which serve as platforms for researchers, academicians, and professionals to exchange ideas and insights, the organization aims to foster continuous learning and facilitate the dissemination of cutting-edge research in various domains of forensics. These include but are not limited to fingerprint analysis, questioned document examination, crime scene investigation, forensic odontology, forensic medicine and toxicology, forensic biology and serology, forensic psychology, cyber and digital forensics, as well as forensic physics and anthropology. By providing such avenues for collaboration and knowledge sharing, IASR and SIFS India are collectively contributing to the advancement and enrichment of forensic science on a global scale, thereby aiding in the effective application of forensic techniques in solving crimes and administering justice.

Teerthanker Mahaveer University

Teerthanker Mahaveer University (TMU) upholds the principles of Lord Mahaveer—Right Philosophy, Right Knowledge, and Right Conduct—in all its endeavors. TMU stands out as a premier private, multidisciplinary university offering career-oriented undergraduate, postgraduate, and doctoral programs across a wide array of fields, including Medical Sciences, Engineering, Management, Law, Agriculture, and Jain Studies.

The university provides a nurturing environment where students are guided by experienced faculty and equipped with both creative and technical skills essential for today's competitive world. With a strong emphasis on research and innovation, TMU is committed to addressing real-world challenges and making meaningful contributions to society.

Education at TMU goes beyond academics, focusing on personality development and specialized skill-building. The Wi-Fi-enabled campus features state-of-the-art laboratories, modern classrooms, residential facilities, and a vibrant atmosphere for extracurricular engagement. This comprehensive ecosystem ensures students graduate as confident, industry-ready professionals with a lifelong passion for learning.

SIFS India

The Sherlock Institute of Forensic Science (SIFS) India was set up in 2006 with the mission to make forensic education available to all and with a vision to make India a crime-free place to live by creating a skilled workforce of forensic experts to assist law enforcement agencies and the judiciary in bringing justice to the table within time.

SIFS India offers comprehensive industry-specific and job-ready online and offline courses, trainings, internships, workshops, and research-based projects in the diverse forensic science domains, like cyber law, cyber and digital forensics, fingerprint verification, questioned document examination, and handwriting analysis, to name a few.

It has been a frontrunner in the field of forensic science. It has been conducting various events to maximize the reach of Knowledge of forensic science across the globe. It organizes various Conferences, Seminars and Workshops with the goal of sharing recent advancements and research happening around the globe with students and professionals to boost their knowledge and morale. Forensic science has been growing significantly over the past few decades; the essential demand for progress has been met with bright young minds putting their extensive efforts into advancements in the field. SIFS India, along with other prominent organizations, have been substantial support pillars in establishing the mark of forensics in India and worldwide. The motive of constant learning and sharing recent studies and advancements has been met constantly with their continuous efforts.

Academic Collaborators

University of Philippines Manila

Holy Angel University Philippines

University of Baguio Phillipines

Federal University of Technology Owerri Nigeria

Lyceum of the Philippines University, Philippines

Tarlac State University Philippines

Institute for Criminalistics, Criminology and Security Republic of Kosovo

Bangladesh Institute of Forensic Psychology & Graphology

Laguna State Polytechnic University

Tomas Claudio Colleges Rizal, Philippines

Professional Security Academy, Jamaica

UTHANDO Institute of Africa

ShieldTech Solution Empire, Ghana

Forensic Investigation for National Development

Mastery Automotive Sales Academy, Zambia

Kalinga State University, Philippines

Atma Ram Sanatan Dharma College, University of Delhi

PSGR Krishnammal College for Women, Coimbatore

Centurion University Andhra Pradesh

Garden City University Bengaluru

Marathwada Mitra Mandal's Shankarrao Chavan Law College, Pune

Saveetha Dental College SIMATS, Chennai

Srinivasan College of Arts & Science Perambalur, Tamil Nadu

Jaipur National University, Jaipur

Holy Cross College Agartala

Medi-Caps University Indore

Mody University Sikar, Raj.

Guru Ghasidas University Bilaspur

Sharda University Gr. Noida

RNT University Bhopal

Galgotias University Gr. Noida

Aditya Degree & PG College Surampalem, A.P.

Kalinga University Naya Raipur

Bharti Vishwavidyalaya Durg, Chhattisgarh

JECRC University Jaipur, Raj.

SGT University Gurugram, Haryana

SHUATS Prayagraj, U.P.

Chandigarh University Mohali, Punjab

Lovely Professional University, Punjab

Indrashil University Gujarat

Parul University Gujarat

Integral Institute of Allied Health Sciences and Research Integral University

Sandip University Nashik

ICFAI University Jaipur

GIFS, Chhatrapati Sambhajinagar

Teerthanker Mahaveer University, Moradabad

Narayan Shastri Institute of Technology, Jetalpur

Vivekananda Global University, Jaipur

Bapuji Educational Association College of Dental Science Davangere

NIMS University Jaipur

Harsha Institutions Bengaluru

Shivaji College Delhi

AJK College of Arts and Science, Coimbatore

Rathinam College of Arts and Science, Coimbatore

The New College Chennai

Aditya University Surampalem

Malla Reddy University Hyderabad

Anjaneya University Raipur, Chhattisgarh

Greetings from the Organizing Desk!

The new era post the global pandemic has affected academics, establishments, and individuals' preparedness worldwide. The CoVID- 19 pandemic has left us all battling for survival and growth leading to endurance changing the scenarios and encouraging learning on a virtual platform. This calls out to encourage the young learners and academicians to keep pace with the same enthusiasm and lead to excellence.

Forensic Science has an interdisciplinary approach, and its true essence can be proved meaningful with collaborative efforts of people present around the globe functioning together as a team. Therefore, with a vision to bring all the academicians, students, and professionals and share their valuable contemplations, the **IASR International Conference on Forensic Science** is structured to lead the way through endeavours focused on taking Forensic to greater heights. We welcome every science enthusiast to become a part of this revolutionizing effort and explore the technological advancements, scientific researches, and opportunities for everyone to flourish.

Dr. Ranjeet Kr. Singh
President
International Association of
Scientists and Researchers

Organizing Team

Convenor in Chief

Dr. Ranjeet Kr. Singh
President
International Association of Scientists and Researchers

Organizing Secretary

Prof. (Dr.) Navneet Kumar

Ravi Kumar

Yogesh Kumar

Afreen Tarannum

Pramod Kumar

Manish Sharma

Saumya Tripathi

Ayushi Arora

Jaya Pandey

Organizing Body


Niharika Mishra


Durgesh Pandey


Harsha Kumari


Vivek Khare


Ruchika Dwivedi


Preeti Shah


Saddam Hussain


Shweta Gupta


Jaydeep Singh


Christy Susan Thomson


Neha Sharma


Harpreet Singh


Ridhi Khandelwal


Laishram Rosciline Devi

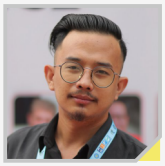

Priyanka Yadav


Manju


Khyati Rao


Rupal Joshi


Priyanka Verma


Chongtham Roshankumar Singh


Naveen P. T.


Jiya Lal


Mankina Bavana Satya Anveshita


Lalit Yadav


Darshan Murali


Vaidik Patidar


Gitanshi Jain


Karthika V S


Hemant Singh


Aman


Trishika Sarkar


Deepika


Pooja Singh


Rohini Kumar


Sirshendu Maiti


Jerald Benny


Vanshika


Edurupaka Divya Keerthana


Ketavathu Sankar Nayak


Reddimelli Vamsi


Gadi Pratyusha


Anusuri Naga Srivallika


Badduri Satya Rahitya


Gangadari Venkataramana


Yarragunta Pranavi


Gundela Akshay Kumar Yadav


Naorem Naobungo

Akash Chauhan

Apoorva Singh

Anshika Srivastava

Ajay Pratap Singh

About the Conference

Forensic Science and Anthropology has been growing significantly over the past few decades; the essential demand of progress has been met with bright young minds putting their extensive efforts into advancements of the field. SIFS India and other fellow organizations have been substantial support pillars in establishing the mark of forensics in India and across the globe. The motive of constant learning and sharing recent studies and advancements have been met constantly with their untiring efforts.

The IASR International Conferences (virtual) has been the torchbearer to provide a platform for avid learners to present their work, get better inputs from experienced individuals and learn from esteemed personalities. Therefore, the Conference aims to provide a platform to researchers, academicians and professionals devoting their efforts to the domains of forensics, such as fingerprint, questioned document, crime scene investigation, forensic odontology, forensic medicine and toxicology, forensic biology and serology, forensic psychology, cyber and digital forensics and forensic physics to flourish the dimensions of the theme of the Conference.

Meet Our SPEAKERS

Community Mapping and IKSP for Forensic Investigations

Prof. (Dr.) Ma. Teresa G. De Guzman

Dean of the College of Arts and Sciences and a Professor of Anthropology at the Department of Behavioral Sciences, University of the Philippines Manila.

Prof. (Dr.) Ma. Teresa G. De Guzman is the Dean of the College of Arts and Sciences and a Professor of Anthropology at the Department of Behavioral Sciences, University of the Philippines Manila. With over 25 years of academic service and two decades of intensive fieldwork, she brings deep expertise in Cultural Anthropology, Humanitarian Forensics, and Heritage Forensics. Her research and practice focus particularly on Indigenous Peoples, cultural heritage, and social impact assessments. She has worked extensively with ethnolinguistic communities such as the Aeta, Mangyan, and Manobo, conducting culturally grounded research and advocacy in both rural and disaster-affected settings. In addition to her scholarly pursuits.

Molecular Barcoding of Trilliu govanianum: Implications for Forensic Identification and Biodiversitv Conservation

Prof. (Dr.) Tina Sharma

Head Department of Forensic Science Bahra University, Shimla Hills

Prof. (Dr.) Tina Sharma is a Professor of Forensic Science at Bahra University, Shimla, with expertise spanning biodiversity crime, fingerprint examination, forensic biology, DNA profiling, and toxicology. She holds a B.Sc. in Biotechnology and M.Sc. in Forensic Science from Punjabi University, Patiala, and is UGC-NET qualified. She received the prestigious UGC-JRF and SRF awards, reflecting her commitment to forensic research and innovation. A prolific researcher and innovator, Prof. Sharma has authored 30+ research papers, contributed to 20+ book chapters, and has edited two books in the field of forensic science. She is also the proud holder of 60+ patents and two design registrations, establishing her as a leading innovator in applied forensic technologies.

The Ripple Effect: How Crime Shapes the Lives of Victims

Dr. Charesma Grace K. Lud-Ayen

Dean University of Baguio, Philippines

Dr. Charesma Grace K. Lud-ayen, RCrim is the Dean of the School of Criminal Justice and Public Safety at the University of Baguio. A topnotcher in the 2004 Criminologist Licensure Exam, she holds two Ph.D. degrees (Criminology and Developmental Education) and is pursuing a doctorate in Public Administration. She has received numerous national and international awards, including the Dakilang Kriminologo Award, Forensic Science Excellence Award, and International Luminary Award in Leadership. Dr. Lud-ayen is actively involved in professional organizations like PCAP, CCJE-CAR, and WUNI, and has served as a judge for QS Reimagine Education Awards globally With strong contributions in forensic science, education, community engagement, and institutional development, she is a leading voice in criminology both in the Philippines and abroad.

USING FORENSIC SCIENCE TO MAKE BLUE MONEY

Awanish Kumar Upadhyay

Scientist-C National Dope Testing Laboratory (NDTL)

Mr. Awanish Kumar Upadhyay is a Scientist-C at NDTL with over 15 years of experience in anti-doping analysis, specializing in LC-MS/MS and LC-HRMS techniques. He has contributed to 24 research publications/posters and received multiple international travel and best paper awards. His expertise includes drug metabolism, method validation, and excretion profiling. He has played a key role in major sports testing events, including the 2010 Commonwealth Games. A member of WAADS and advisory board member of CCIFS, he also mentors postgraduate students and trains young scientists in analytical techniques.

Forensic Taphonomy in the Indian Context: Challenges and Opportunities

Dr. Umema Ahmed

HOD & Professor, Forensic Science Vivekananda Global University
Jaipur

Prof. (Dr.) Umema Ahmed is an accomplished forensic science educator and researcher with over 14 years of experience. She currently heads the Department of Forensic Science at Vivekananda Global University, Jaipur. Her work emphasizes innovative pedagogy, including crime scene simulations, and student-centered learning. She holds a Ph.D. in Molecular Microbiology and has authored numerous publications in reputed journals. Her contributions include 12 copyrights, 1 patent, and guiding student-led startups. Recognized with awards such as the Best Woman Faculty Award (2023) and Dr. S. Radhakrishnan Award (2013), she is also an honorary advisory board member at CCIFS.

Contemporary Approaches to Age Estimation in Forensic Anthropology and Odontology

Dr. Vineeta Saini

Head And Associate Professor, Dept. Of Forensic Science

Dr. Vineeta Saini, ma'am is an Associate Professor at SGT University, Gurgaon, has a robust academic and research background in forensic science. Ma'am holds a Ph.D. in Forensic Science from Banaras Hindu University and has over 14 years of teaching and research experience. Ma'am research interests encompass forensic anthropology, odontology, serology, toxicology, DNA fingerprinting, child abuse, and femicide. Ma'am has been recognized with several awards for paper presentations in International and national Conferences. She has been awarded the best teacher award from Koshambi Foundation in 2021. Ma'am has received intramural funding from SGT University for various forensic science projects. Ma'am has published over 35 articles in reputed journals and has contributed to several book chapters on different forensic aspects.

Medico-Legal Death investigation

Dr. Renu Devi

HOD Forensic Science Department NIMS University, Jaipur

Dr. Renu Devi is a seasoned forensic science professional with over 7 years of teaching and 5 years of research experience, currently serving as Head of the School of Forensic Sciences at NIMS University Rajasthan, Jaipur. A NET-JRF qualified Ph.D. from Punjabi University, her expertise lies in forensic anthropology, particularly bone length reconstruction. She has held key academic roles at institutions like Sandip University, Mody University, and the Institute of Forensic Science, Mumbai. Dr. Devi has organized national and international conferences, including as Convener of the DST-sponsored ICRDFS-2024, and has delivered invited talks at reputed forums. Her research spans handwriting analysis, spectroscopy, fingerprint studies, and criminal profiling, with several peer-reviewed publications. She is certified in forensic odontology and cybersecurity, and trained at leading forensic labs across India. Multilingual and research-driven.

Green Forensic Toxicology

Dr. Rajeev Jain

Scientist - B (Toxicology) Central Forensic Science Laboratory, Ministry of Home Affairs, Govt. of India.

Dr. Rajeev Jain is serving as Scientist-B in Toxicology at CFSL Chandigarh with over 15 years of experience in forensic toxicology. He holds a Ph.D. in Analytical Toxicology from CSIR-IITR and has examined 1500+ medico-legal cases, including high-profile incidents like mass poisoning and drug-facilitated crimes. A key contributor to forensic innovation, he developed the eco-friendly Rotating Paper Disc (RPD) device and established India's only CFSL facilities for snake venom detection and quantitative drug estimation. With 65+ publications, a patent, and an h-index of 23, he is also the first CFSL toxicologist to qualify the UNODC PT Programme. Currently serving as Quality Manager at CFSL, he is an Editorial Board Member of Green Analytical Chemistry and a respected speaker and reviewer in the field.

Challenges in Questioned Document Examination

Vidyam Muralidhar

Assistant Director Telangana Forensic Science Laboratory
Hyderabad

Mr. V. Muralidhar is a highly experienced forensic expert currently serving as Assistant Director at the Telangana Forensic Science Laboratory. Holding qualifications in Science, Law, and Forensic Science (PGCFSC), he specializes in Questioned Document Examination, having handled thousands of cases involving handwriting, signatures, and document forgeries. He has provided expert testimony in numerous courts across Telangana and Andhra Pradesh and has also appeared before Advocate Commissioners in several key cases. As a respected trainer, he has delivered lectures at Police and Judicial Academies, contributing to the professional development of law enforcement and legal personnel.

Forensic Bioarchaeology and Human Rights

Ma. Jasminda Liza R. Ceron

Assistant Professor Department of Social Sciences, College of Arts and Sciences, University of the Philippines Manila

Ma. Jasminda Liza R. Ceron holds a Ph.D. in Archaeology from the University of Otago, New Zealand (2021), and both her M.A. in Archaeology (2013) and B.A. in Anthropology (2002) from the University of the Philippines Diliman. She has extensive academic experience across the Philippines and New Zealand, having held teaching and research positions at the University of Otago, the University of the Philippines Diliman, the UP Open University, and UP Manila. Jasminda's teaching portfolio spans a wide range of subjects, including archaeology, anthropology, urban development, development studies, and community studies. She has also served in academic support roles, including as a Graduate Research Ambassador (Graduate Research Fellow) and Humanities Postgraduate Representative at the University of Otago.

Alternative Biological Matrices: Expanding the Horizons of Forensic

Dr. Beauty Arora

Senior Assistant Professor, Department of Forensic Science Government Institute of Forensic Science, Chhatrapati Sambhajinagar, Maharashtra

Dr. Beauty Arora is a distinguished academician and researcher with over 19 years of experience in forensic science. She holds an M.Sc. from the National Institute of Criminology and Forensic Science (NICFS), New Delhi, and a Ph.D. from AIIMS, New Delhi. She has previously served at Gujarat Forensic Sciences University (Gandhinagar), Dr. Harisingh Gour Central University (Sagar), and Institute of Forensic Science (Mumbai). Her research interests lie in Forensic Chemistry and Toxicology, with several publications in high-impact journals. She has led and contributed to projects funded by RGSTC, Mumbai, and the International Services Assistance Fund (USA). In recognition of her contributions, she received the Young Scientist Award from the Ministry of Home Affairs, Government of India.

Anti-doping Science: Innovation and ChallengesToxicology

Prof. (Dr.) P. L. Sahu

Director & CEO (i/c) National Dope Testing Laboratory (NDTL).

Prof. (Dr.) P. L. Sahu is currently serving as the Director & CEO (I/c) of the National Dope Testing Laboratory (NDTL), Government of India. With over 31 years of experience in analytical R&D, he has worked with leading pharmaceutical companies such as Lupin, Dr. Reddy's, Jubilant Life Sciences, and internationally with Abdi İbrahim, Turkey. He holds a Ph.D. in Chemistry and has led critical roles including Head R&D at the Indian Pharmacopoeia Commission. Dr. Sahu is a Technical and Lead Assessor for ISO/IEC 17025 and ISO 17034 under NABL, and serves as Professor of Practice at NFSU and Adjunct Professor at NIPER-Hyderabad. He is also a senate member of NIPER-Ahmedabad and a UNESCO Global Task Force member. At NDTL, he has advanced anti-doping science through innovation and international collaboration, and he has recently been appointed as Director of APMU, India.

Human rights and international humanitarian law

Blanca Viviana Ushñahua Grández

Registered Attorney Bar Association of Huánuco (N° 3129)

Blanca Viviana Ushñahua Grández is a licensed attorney from Peru with over 10 years of experience in criminal, labor, civil, and constitutional law. She holds a Master's degree in Criminal Law and is currently pursuing a Doctorate in Law at the National University Hermilio Valdizán. Her professional background includes roles in the judiciary, legal firms, and government programs, with expertise in litigation, judicial administration, legal research, and academic event organization. She has participated in numerous national and international legal conferences and holds multiple diplomas in legal specializations. Viviana is a dedicated, ethical, and results-driven legal professional, fluent in Spanish and proficient in English.

Cross - Border Forensic Evidence Gathering for Global Justice

Dr. Atty. Ariel D. Valones

MD, JD, LLM, MPH,MHA,DIH,FAMP,FPCP, FPCC,FAsCC University of Santo Tomas, Assistant Vice President of Philippine Institute of Arbitration, Development Committee, Manila Med, Philippine Heart Center, Polytechnic University of the Philippines, MLQU, PCUUniversity of Santo Tomas

Prof. Dr. Atty. Ariel Dasas Valones, LLM, JD, MD, MPH, MHA, DIH, FAMP, FPCP, FPCC, FAsCC is a Cardiologist-Lawyer. He is an Assistant Vice President for Development Committee, Philippine Institute of Arbitrators (PIARB), Technical Working Group and Subject Matter Expert, Legal Education Board, Scholar at University of Cambridge, Scholar Fellow of the National University of Singapore and Fellow of the ASEAN College of Cardiology. He obtained a Master of Laws (LLM), Master of Public Safety, Masters in Public Health, International Health, and Hospital Administration with Scholarship and Academic Excellence. He has been a Keynote Speaker in the 15th and 16th IASR Conference on the nexus of Health, Law, Business and Forensic Science.

Forensic in Counter Terrorism and Cyber warfare Investigations

Dr. Irene D. Valones, DCL, DPA

DCL, DPA, LLM (London, United Kingdom), MPM Supreme Court of the Philippines

Dr. Irene D. Valones, DCL, DPA is a Court Attorney in the Supreme Court of the Philippines and a Subject Matter Expert on Forensics, Cybercrime, and Cybersecurity. She obtained her Doctor of Civil Law (Cum Laude), Doctor of Public Administration (Highest Distinction), Master in Public Management (Dean's Lister), and Master of Law (LLM) in Transnational Law (With Merit) at King's College London, United Kingdom as a Chevening Scholar. Presently, she is the President of the Chevening Alumni Foundation Philippines and Board of Trustee. Irene serves as the representative of the Wider Asia on the United Nation Conference of the Parties and a recipient of Her Majesty Scholarship Grant, United Kingdom. She teaches in various law schools and the Graduate School of Law in the Philippines, a Technical Expert, and Subject Matter Expert of the Legal Education Board and is affiliated with various organizations.

Historical Forensics, Policy, and Community Justice

Joan Tara R. Reyes

Associate Professor 3, Department of Behavioral Sciences University of Philippines Manila

Joan Tara Reyes earned her Ph.D. degree in History from the University of the Philippines, Diliman. She also attained her M.A. Archaeology and B.A. History from the same university. Her research focuses on archaeological and cultural funerary practices, Philippine intellectual history and Historical Archaeology. She is currently an Associate Professor in the Department of Behavioral Sciences of the University of the Philippines, Manila. She also taught Archaeology and History subjects in UP Diliman and UP Los Baños. She applies her expertise to archaeological impact assessment projects and heritage studies.

Advanced Forensic Science: Interdisciplinary Synergy from Crime

Yogesh Kumar

Assistant Professor of Forensic Science at Teerthanker Mahaveer University (TMU), Moradabad

Mr. Yogesh Kumar is an Assistant Professor of Forensic Science at Teerthanker Mahaveer University (TMU), Moradabad, with over 18 years of extensive field and lab experience. He has served as In-charge of the Forensic Science Laboratory, A&N Police (2013–2024), and has investigated 1000+ crime scenes, contributing to several high-profile cases. Holding a Master's in Forensic Science, Psychology, and a PG Diploma in Journalism, he is currently pursuing a Ph.D. in Forensic Science. His research includes the first classification of bleeding patterns in postmortem ant bite cases, a pioneering study on suicide in the Andaman & Nicobar Islands, and work on forensic taphonomy and body farms in India. A sought-after trainer and speaker, he has delivered lectures on crime scene investigation, NDPS, and death investigation at national and international platforms. He is a lifetime member of IASR, IAMLE, and CCI.

Strengthening Forensic Practice: Lessons from the Journey

Fatima Garba Galadima

Head, Quality Control and Assurance Unit, Forensics and Crime Laboratory Services Department (FCLSD)

Fatima Garba Galadima is a seasoned quality management expert with over 18 years of experience. She leads the Quality Control and Assurance Unit at the EFCC's Forensics and Crime Laboratory Services Department, where she oversees the implementation of ISO/IEC 17025:2017 accreditation. Ma'am is a Certified Fraud Examiner and P.E.A.C.E. Investigative Interviewer, ma'am also holds multiple ISO certifications, including Lead Assessor (ISO/IEC 17025), Lead Auditor (ISO 9001), and Risk Manager (ISO 31000). Fatima is known for driving cross-functional compliance initiatives and aligning people, processes, and standards to enhance forensic performance and integrit

Conference Structure

Day 1 – 12th September 2025

Scientific Session - 01	10:00 AM - 10:30 AM IST	Prof. (Dr.) Ma. Teresa G. De Guzman
Scientific Session - 02	10:30 AM - 11:00 AM IST	Prof. (Dr.) Tina Sharma
Scientific Session - 03	11:00 AM - 11:30 AM IST	Dr. Charesma Grace K. Lud-Ayen
Scientific Session - 04	11:30 AM - 12:00 PM IST	Awanish Kumar Upadhyay
Scientific Session - 05	12:00 PM -12:30 PM IST	Dr. Umema Ahmed

Day 2 – 13th September 2025

Scientific Session - 06	10:00 AM - 10:30 AM IST	Dr. Vineeta Saini
Scientific Session - 07	10:30 AM - 11:00 AM IST	Dr. Ridamjeet Kaur
Scientific Session - 08	11:00 AM - 11:30 AM IST	Dr. Renu Devi
Scientific Session - 09	11:30 AM - 12:00 PM IST	Dr. Rajeev Jain
Scientific Session - 10	12:00 PM - 12:30 PM IST	Vidyam Muralidhar
Scientific Session - 11	12:30 PM - 01:00 PM IST	Dr. Jasmina Ceron

Day 3 – 14th September 2025

Scientific Session - 12	10:00 AM - 10:30 AM IST	Dr. Bhoopesh Kumar Sharma
Scientific Session - 13	10:30 AM - 11:00 AM IST	Dr. Reena Susan Philip
Scientific Session - 14	11:00 AM - 11:30 AM IST	Dr. Beauty Arora
Scientific Session - 15	11:30 AM - 12:00 PM IST	Prof. (Dr.) P. L. Sahu
Scientific Session - 16	12:00 PM - 12:30 PM IST	Blanca Viviana Ushñahua Grández
Scientific Session - 17	12:30 PM - 01:00 PM IST	Dr. Atty. Ariel Dasas Valones
Scientific Session - 18	01:00 PM - 01:30 PM IST	Dr. Irene Dasas Valones
Scientific Session - 19	01:30 PM - 02:00 PM IST	Dr. Tara Reyes
Scientific Session - 20	02:00 PM - 02:30 PM IST	Yogesh Kumar
Scientific Session - 21	02:00 PM - 02:30 PM IST	Fatima Garba Galadima

Esteemed Panel of Jury Members

Prof. (Dr.) Navneet Kumar
Principal, College of Paramedical Sciences
Teerthankar Mahaveer University
Moradabad

Dr. Suneet Kumar
Scientific Officer
FSL, Moradabad

Dr. T. Sowmyya
Assistant Professor
Forensic Science
Osmania University, Hyderabad

Dr. Richa Arora
Assistant Professor
Shivaji College
University of Delhi

Dr. Himali Upadhyay
Postdoctoral Associate
Florida International University

Vilas Anil Chavan
Associate Dean, School of Sciences
Aditya University
Andhra Pradesh

Indrani P.
HOD Forensic Science
Malla Reddy University
Hyderabad

Vaishnavi Thakre
Head and Assistant Professor
Department of Forensic Science
JECRC University, Jaipur

Saumya Tripathi
Assistant Professor
Teerthanker Mahaveer University
Moradabad.

Winners Scientific Presentation

Undergraduate Paper Presentations

Srinjoy Roy

Kavya Gupta

Anshu Tyagi

Postgraduate Paper Presentations

Riya Gosh

Ajayakumar A

Dr. Manjunath Muttalageri

Scholar Paper Presentations

Nandini Mahankar

Anirudha Dixit

Ndikumana Etienne

PAPER (Undergraduate Category)

- PUG01 | Chaitra Goudar
  Virdentopsy: Advancements In Virtual Dental Autopsy For Forensic Human Identification

- PUG02 | Mullai Malar.k
  Unheard Cries: A Survey on Violence Against Dogs in Tamil Nadu

- PUG03 | Shrishti Mishra
  Synthetic vs Natural Cannabinoids: Toxicological Impact and Advances in Detection Techniques

- PUG04 | Nikhil Kumar Jha
  Entomology

- PUG05 | Thayanithi CA
  The Evolving Landscape of Modern Cyber Threats: A Comprehensive Review

- PUG06 | Kavya Gupta
  Wild clues from AI and DNA prints: Implications in Wildlife Forensics

- PUG07 | Srinjoy Roy
  Revolutionising Forensic DNA Analysis with CRISPR-Cas Technology: A Comprehensive Review of its Emerging Applications, Challenges and Future Directions

- PUG08 | Dr. Natalia Muljadi
  The Diatome Test: Proving Death by Drowning

- PUG09 | Yentinawati Br Simanjuntak
  Autopsy findings: Determining the cause of death in a decomposed death body found in a flowing river- DROWNING OR TRAUMATIC INJURY?

- PUG10 | Dr. Budianto
  Comparing the Rate Decomposition of Human Corpses in Open Spaces, Closed Spaces, and Water Media: Case Series

- PUG11 | Anshnu Tyagi
  Establishing Forensic Standards in Online Radicalization Analysis: Psychological Markers and AI-Enhanced Detection

- PUG12 | Manjot kaur
  Digital Forensics and Cybercrime Investigation: Challenges and Advancements

- PUG13 | Sneha
  Molecular Ballistics: Advancing Forensic investigation through DNA and RNA profiling of Backspatter

- PUG14 | Reena .k
  Autopsy Techniques and Post Mortem Examination

- PUG15 | Aman Raj
  Autopsy Techniques and Post-mortem Examination

- PUG16 | Komal Mahey
  Ethical And Legal Issues In Forensic

- PUG17 | Ritika Giri
  Crime Scene Investigation and Reconstruction

- PUG18 | Mitali
  Forensic Psychology and Behavioral Analysis

- PUG19 | Prabeen kaur
  Crime Scene Examination of a Suicidal Pact: A Case Report

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  Forensic Science And Its Limitations In Rape Cases In India

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- PPG02 | Kalpa C S
  Social Media Monitoring For Detection Of Sex Trafficking

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  Multilingual Voice Identity Analysis Using AI In Southern Indian Languages

- PPG04 | Dr. Chirag bhat R
  Clinico-Epidemiological Profile and Determinants of Fatal Injuries Sustained by Pedestrians in Road Traffic Accidents

- PPG05 | Alex Joseph Varghese
  Molecular Fingerprinting of the Latent Print Residue for Criminal Profiling: A Review

- PPG06 | Ajayakumar A
  Advancement in Age Estimation in Forensic Science Through Molecular Fingerprinting Techniques – A Review Paper.

- PPG07 | Riya Ghosh
  A Comprehensive Study on the Impact of Traditional Cooking Practices on Toxin Formation in Rice and Associated Public Health Risks

- PPG08 | Dr. Manjunath Muttalageri
  A cross sectional evaluation of the histo pathological alteration in Lungs, Liver and kidneys among fatalities caused by organophosphorous poisoning

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- PSC04 | Jatinder Kaur
  Forensic analysis of class characteristics of English handwriting across diverse population

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Haryana

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  Handwriting Characteristics in Autism Spectrum Disorder: A Systematic Review and Forensic Implications

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- PSC12 | Dariusz Wilk
  The development of DNA databases for forensic purposes worldwide over the past 30 years

- PSC13 | Prerna
  Environmental challenges and Forensic approaches in Mass Disaster Victim Identification

- PSC14 | Chavda Bhumit Govindbhai
  Quantitative PMI Estimation from Hepatic Protein Decay: Assay-Validated Evidence

- PSC15 | Nagasshree M N
  Analysis of Bee Sting Venom: Forensic Medicine and Entomology Perspectives on Toxicological Effects and its Implications in Death Investigations.

- PSC16 | Ndikumana Etienne
  Advancing Simultaneous Opioid Detection: Optimization of Extraction Efficiencies and Validation of an LC-MS Method for Analyzing Illicit and Prescription Opioids of Misuse in Human Urine

- PSC17 | Kanika Chauhan
  Role of writing scripts in Development of handwriting characteristics in a population

- PSC18 | Aakanksha Soni
  Matrix Interference Challenges in Nutritional Supplement Testing: A Forensic Analytical Perspective

- PSC19 | Anirudha Dixit
  Intercepting Novel Psychoactive Substances: A GC-HRMS Method for Integrated Screening, Confirmation, and Quantitation in Forensic Drug Analysis

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  Synthesis and Characterization of Rhodamine B-loaded Chitosan Nanoparticles for Forensic Application

- PSC21 | Donkina Nagesh
  Evaluation of Seasonal variations in soil of Andhra Pradesh by using Stereomicroscope with Python based image analysis

- PSC22 | Dr. Ngangyola Tuikhar
  Forensic Microbial Signatures: Comparative Analysis of Gut Microbiota in Naga and Meitei community

- PSC23 | Neha Badhwar
  Seasonal variations in the elemental composition of wetland soil by XRF

- PSC24 | Shivali
  Forensic Investigation on blue stamp pad inks using UV visible spectroscopy

- PSC25 | Tanvi Sharma
  A Critical Review on Modern Techniques of Fingerprint Development and Enhancement

- PSC26 | Harshita Sonkar
  Impact of Educational Stress on Mental Health in Young Adults

- PSC27 | Rahul Kumar
  Human Identification Beyond DNA: The Role of Bio-Cultural Markers

for Forensic Investigation.

- PSC28 | Ankita Pundir
  Blue Ballpoint Pen Ink Discrimination Using ATR-FTIR and PCA: Influence of Substrate Thickness and Surface Characteristics

- PSC29 | Dharmistha Parmar
  A Comprehensive Review of Deepfake Audio Detection: Techniques, Applications, and Countermeasures

- PSC30 | Arunima Dutta
  A comparative study between different machine learning algorithms for sex and ethnicity estimation

- PSC31 | Dr. Suchita Rawat
  Analyzing Regional Patterns and Temporal Trends of Cybercrime in India (2016–2022) with Predictive Forecasting Using NCRB Data

- PSC32 | Ajay Pratap Singh
  Need of Food Forensics in Indian Context

- PSC33 | Shakshi Tyagi
  Silent Killers at Home: Toxicological and Medico-Legal Perspectives on Readily Available Substances

VIRDENTOPSY: ADVANCEMENTS IN VIRTUAL DENTAL AUTOPSY FOR FORENSIC HUMAN IDENTIFICATION

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Abstract

Virdentopsy, represents a significant advancement in the field of forensic human identification, combining traditional dental practices with modern digital technologies. This innovative approach utilizes 3D digital imaging to create detailed, non-invasive visualizations of dental structures, enabling accurate comparison between postmortem and antemortem records. Through the integration of teleforensic systems, dental data can be remotely accessed and analyzed by forensic experts across geographical boundaries, streamlining identification processes, especially in mass disaster scenarios. Artificial intelligence further enhances Virdentopsy by assisting in the estimation of sex and age, improving the objectivity and reliability of forensic interpretations. Compared to conventional dental autopsy methods, which often involve invasive procedures and physical handling of remains, virtual dental autopsy offers distinct advantages such as reusability of data, reduced contamination risk, and improved ethical compliance. Overall, Virdentopsy provides a forward-looking, technology-driven solution that supports accurate, ethical, and efficient forensic human identification while addressing many limitations inherent in traditional methods.

Keywords: *Virdentopsy, 3D Digital Imaging, Teleforensics, Human Identification, Dental Autopsy*

UNHEARD CRIES: A SURVEY ON VIOLENCE AGAINST DOGS IN TAMIL NADU

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Abstract

In Tamil Nadu, there is a growing concern over violence against dogs, yet many incidents go unreported or unrecognized. Through a poll of eyewitnesses, this study examines public awareness of and reaction to incidents of cruelty against dogs. The purpose of the poll is to find out how frequently these kinds of instances occur, how ready people are to report them, and how law enforcement agencies react. Information is gathered from people who have seen violence against dogs firsthand, and it is examined whether these incidents were recorded, how the police responded, and how well laws function to combat animal abuse. The findings draw attention to the need for more robust legal and societal measures to safeguard animals, as well

as gaps in law enforcement and public reluctance to complain. To reduce violence against dogs in Tamil Nadu, the report urges stronger enforcement of animal protection regulations, improved awareness campaigns, and community-led projects

Keywords: *Animal cruelty, Violence against dogs, Stray dog abuse, Legal action on animal cruelty, and Public awareness.*

SYNTHETIC VS NATURAL CANNABINOIDS: TOXICOLOGICAL IMPACT AND ADVANCES IN DETECTION TECHNIQUES

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Abstract

Cannabis has been in use for more than a thousand years, as mentioned in some Indian texts and in China too. In India, cannabis was consumed by Shiva devotees in the form of 'bhang'. It was banned in India through the Narcotic Drugs and Psychotropic Substances Act as its misuse started, which was other than medicinal use. One hundred compounds are recognized as cannabinoids that interact with the endocannabinoid system. Such a class comprises phytocannabinoids themselves existing in nature and synthetic cannabinoids that imitate the actions of natural phytocannabinoids such as Δ9-tetrahydrocannabinol (THC) and cannabidiol (CBD). Synthetic cannabinoids sold illegally on the market under names such as Spice and K2 present enormous public health issues because they are of sometimes extreme potency, varied structure, and unwanted toxicities arising less due to a direct deliberate design than almost accidentally by the conglomerating chemical wizardry of their chemist producers. This paper discusses the toxicological implications and the analytical approaches for natural cannabinoids and synthetic cannabinoids alike. Poisoning symptoms may range from tachycardia, anxiety, and vomiting to acute psychosis and seizures, renal damage, and death in rare situations. Since synthetic ones have the greatest affinity for CB1 receptors, cases of intoxication and psychotropic effects are usually more intense than those of THC. An advanced analytical approach is needed to identify these compounds in biological matrices such as blood, urine, saliva, and hair samples. Immunoassay procedures are usually applied for screening, but, because of their low cross-reactivity for the novel synthetic analogs, hence must be supported by confirmatory testing using gas chromatography-mass spectrometry (GC–MS), LC-MS/MS (liquid chromatography-tandem mass spectrometry), and HRMS (high-resolution mass spectrometry). Through these means, the parent drug and its metabolites can be detected, whether or not the parent compound is present. By way of integrating toxicological data with advanced analytical technology, this review attempts to emphasize the urgent need for constant enhancement of reliable detection methods and a thorough understanding of health risks caused

by cannabinoids. The most important area of collaboration that the review stresses is given to keeping up with the very fast pace of cannabis use.

Keywords: *tetrahydrocannabinol (THC), cannabidiol (CBD), toxicological implications, analytical approaches, natural cannabinoids, synthetic cannabinoids, reliable detection methods*

THE EVOLVING LANDSCAPE OF MODERN CYBER THREATS: A COMPREHENSIVE REVIEW

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Abstract

This chapter provides an extensive analysis of the contemporary cyber threats that challenge modern information systems. It tends to examine the emerging landscape of the cyber threats from the very traditional vectors to sophistication, especially AI specific threats that are emerging in the current digital ecosystem. This chapter offers various insights into the varying nature of the cyber risks through a comprehensive examination of the threat - actor motivations, capabilities and methodologies. Moreover, particular focus has been provided to advanced persistent threats (APTs), supply chain compromises, evolution in ransomware, and evolving attack surfaces created by IoT, cloud computing and remote work environments. In this chapter, it also explores how these threat actors are constantly transforming and leveraging artificial intelligence to increase their capabilities, thereby forming additional concerns for defensive frameworks. Security practitioners can better devise and implement effective measures to safeguard information systems when facing a multifaceted continuously evolving threat environment by grasping these contemporary threat vectors. The literature explains an evolution of cyber threats, from amateur intrusions to sophisticated, organized incursions, including those sponsored by a state. Researchers documented how supply chain compromises, insider threats, and ransomware-as-a-service ecosystems amplify sector-wide risks. Nation-state groups, like those associated with the Hafnium and SolarWinds incidents, showcase advanced persistent threats (APTs) while organized cybercriminals distribute the requisite services and tools via the dark web. Moreover, research was conducted that demonstrated how conventional defenses are being sidestepped by deepfake and automated vulnerability discovery AI technologies, proving perimeter-based defenses utterly insufficient. As mentioned, the literature defines the need for a proactive, AI-supported detection system and zero-trust architecture in emerging vulnerability landscapes, while adaptive intelligence driven frameworks fortify next-generation threats. The reliance on a singular system cannot yield results. Collaboration across sectors is just as important, with the focus shifting to actively filling the skills gap in the cybersecurity workforce. A comprehensive approach, balancing

technical, organizational and strategic layers, helps tackle risk and build resilience in the face of a never-ending evolution of threats.

Keywords: *Modern cyber threats, threat actor evolution, advanced persistent threats, supply chain attacks, ransomware, IoT vulnerabilities, cloud security threats, AI-enhanced attacks*

WILD CLUES FROM AI AND DNA PRINTS: IMPLICATIONS IN WILDLIFE FORENSICS

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Abstract

Some of the most critical environmental crimes include illegal wildlife trade, poaching, and trafficking that are the driving cause for biodiversity loss, disrupting ecosystems and threatening humans. In cases where specimens are fragmented, degraded, or deliberately altered, traditional identification methods that rely on morphology, isotopy or microscopy are usually ineffective (Sahajpal et al., 2021). To overcome this, DNA-based techniques have become an essential part of wildlife forensics. It helps with species identification, tracing geographic origins, and checking genetic integrity in cases like ivory tracking and tiger conservation (Mishra et al., 2014). Recent advances that are happening in the field are incorporating artificial intelligence (AI) and machine learning (ML) causing adaptations. AI-driven models applied to MALDI-ToF mass spectrometry, using altered random forest algorithms, helped faunal species classification from ancient bone samples with minimal error, even when genetic data were scarce (Gu & Buckley. 2018). DNA barcoding has become the molecular gold standard for identifying processed or mixed products (Herbert et al. 2018).Global databases like BOLD (Rana et al., 2017) and GenBank (Benson et al., 2018) together with bioinformatics tools such as MitoZ and Kraken2, support this approach by streamlining analysis(Meng, Li., at el., 2019). At the population level, microsatellite markers reveal structure, gene flow, relatedness, and use in forensic identification as shown in Bengal tigers where heterologous loci showed high polymorphism and reliability (Mishra et al., 2014). AI-ML helps wildlife forensics by making marker discovery faster, automating population analysis, and improving species identification, like in the case of Eurasian badgers (Backiyalakshmi & Divya, 2024).Tools like PawPrint+ use AI-trained databases for footprint-based identification, supporting both forensics and conservation (Song et al., 2025). Advancing wildlife forensics requires stronger databases, unified regulations, and cross-field collaboration. Combining DNA techniques with AI-ML allows precise, large-scale applications that support both law enforcement and conservation.

Keywords: *Wildlife Forensics, Artificial Intelligence (AI) and Machine Learning (ML), DNA Barcoding, Illegal Wildlife Trade, Biodiversity conservation*

REVOLUTIONISING FORENSIC DNA ANALYSIS WITH CRISPR-CAS TECHNOLOGY: A COMPREHENSIVE REVIEW OF ITS EMERGING APPLICATIONS, CHALLENGES AND FUTURE DIRECTIONS

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Abstract:

Forensic DNA analysis, a central domain in Forensic Science, has emerged as a transformative tool in personal identification, paternity and kinship testing and disaster victim identification. Traditional methods used such as Short Tandem Repeat (STR) and Single Nucleotide Polymorphism (SNP) profiling are often limited by challenges such as low template DNA, degraded samples in mass disasters, allele dropout and mixed contributor profiles in sexual assault cases, thereby leading to inconclusive results and misinterpretation. A recent approach in genome-editing technology, the CRISPR-Cas (Clustered Regularly Interspaced Short Palindromic Repeats – CRISPR Associated), initially characterised as a prokaryotic adaptive immune mechanism, has revolutionised the field of biotechnology with the capability to demonstrate potential in targeted marker enrichment, rapid sequencing, non-PCR-based detection and enhanced specificity, sensitivity and performance in degraded samples. This review analysed 11 peer-reviewed studies till 2025 selected from Google Scholar, Scopus and Web of Science through stringent exclusion and inclusion criteria. It critically appraises the emerging applications of various CRISPR-Cas platforms (Cas9, Cas12a, Cas12b, Cas13, Cas14) in Forensic DNA Analysis and their benefits over conventional DNA profiling techniques. Most applications of this novel genome technology remain at proof-of-concept and laboratory validation stage. Though the use of this advanced technology is deemed helpful in mixed profile attribution in LCN contributors, the CRISPR-Cas technology poses a significant risk from the generation of ghost DNA profiles by modification or alteration of target genetic markers. Additionally, the review underscores the importance of ethical and legal issues and integration of CRISPR with digital forensics and biosensor platforms. However, CRISPR-Cas systems need to meet validation standards such as Daubert's or Frye's standard to be admissible as evidence in the court of law. Continued research and widespread application of CRISPR-Cas systems in pilot forensic casework studies are crucial for this field to be incorporated into routine forensic practice.

Keywords: *CRISPR-CAS, DNA Profiling, STR, Ghost Profile, Mixed Profile*

THE DIATOME TEST: PROVING DEATH BY DROWNING DISCOVERY: CASE REPORT

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Abstract

Background: Drowning is a type of asphyxiation caused by fluid entering the respiratory tract. The diagnosis of drowning death presents substantial obstacles in the field of forensic medicine, especially when the victim's body is discovered in a decomposed state. The study of deteriorated remains typically yields no distinguishing features. Laboratory examinations of bone marrow specimens are frequently regarded as the most trustworthy means of substantiating the concept of antemortem drowning, as they are less vulnerable to contamination by post-mortem submersion. Case Report: A body, MR X, aged between 35 and 50 years, was found by a fisherman in the Suramadu waters on the Madura side and was initially mistaken for a doll on September 15, 2024. The body was found floating, lying on its back. The witness then informed the security officer on duty at Tanjung Perak Port about the body found. At the Hospital, the forensic team identified the body based on the Visum et Repertum (VeR) request letter. Result: Investigations were conducted externally, internally, and in the laboratory. An acid-digestion test for bone marrow in the left femur showed a positive result for diatoms. Conclusion: The diatom test is a popular forensic technique for determining the exact scene of an accident and establishing drowning as the primary cause of death.

Keywords: *Pathology Forensic; drowning; Autopsy Finding; Diatom Test*

AUTOPSY FINDINGS: DETERMINING THE CAUSE OF DEATH IN A DECOMPOSED DEATH BODY FOUND IN A FLOWING RIVER-DROWNING OR TRAUMATIC INJURY?

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Abstract

Background: Diagnosis of drowning is still a difficult task. Autopsy findings characteristic to drowning (e.g. Sand in the airways, paltauf's spots, water in the sinuses and stomach, emphysema aquosum). Advanced decomposition can further hinder the evaluation of these signs. Additionally drowning incidents are compounded by factors such as injury, intoxication, or exposure to extreme environmental conditions. Diagnosing death by drowning in forensic medicine is particularly challenging, especially when the body is discovered in a state of decomposition.

Case: A man, Mr. X, is approximately 30-50 years old. The person was found dead on Saturday, June 28, 2025, at 7:00 AM. Decomposed death body was found floating in the Porong River, Porong District, Sidoarjo Regency.

Result: The cranial suture closure method, the estimated age of the person is between 30.3-48.5 years. During the external examination, signs of decay were found, bluish discoloration of the mucous membranes of the lips, gums, fingertips, and nails of all four extremities. Blood extravasation was found on the right side of the inner scalp. Neil's positive signs were found in the bones at the base of the skull, brain porridge. On the right side of the skull, a single curved linear fracture was found, fracture of the right sternum at the eighth, ninth, tenth, and eleventh ribs. Right lung adhesion to the chest wall. Sand was found in the upper and lower respiratory tracts. Diatom examination on the left femur showed positive results for diatoms. **Conclusion:** The cause of death was due to fluid entering the upper and lower respiratory tracts, obstructing the airways and causing asphyxia, which was exacerbated by blunt force trauma to the right side of the head.

Keywords: *Drowning, Injury, Decomposition, Diatoms, Autopsy*

COMPARING THE RATE DECOMPOSITION OF HUMAN CORPSES IN OPEN SPACES, CLOSED SPACES, AND WATER MEDIA: CASE SERIES

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Abstract

Introduction: The decomposition process of a corpse is the result of complex biological, chemical, and physical changes after death. The rate and pattern of decomposition are strongly influenced by external environmental factors, such as temperature, humidity, air velocity, and immersion media. A thorough understanding of the environmental influences on the decomposition process is essential for estimating the postmortem interval, a crucial element in modern forensic medicine practice.Case Report and Method: Comparing the rate of decomposition of human corpses without any diseases in three different environmental

conditions: open space (exposed to air, sunlight, humidity and insects), closed space (minimal ventilation and exposure), and water media (immersion in fresh water or sea water), based on objective forensic parameters. The parameters observed included the onset and progression of livor mortis, rigor mortis, skin color changes, and necrophagous insect activity in corpses with no history of chronic diseases such as diabetes mellitus and cancer. The mortality data with decomposition obtained with time span June 2024 to June 2025.Discussion: The fastest decomposition rates were observed in bodies placed in open spaces, followed by water media, while enclosed spaces showed significantly slower progression. Insect activity and air circulation contributed significantly to the accelerated decomposition process in open spaces. In water media, autolysis was enhanced, but delayed insect colonization and the cooling effect of water resulted in slower decomposition rates compared to open spaces. Enclosed spaces exhibited local hypoxic conditions that delayed microbial and insect activity, resulting in delayed onset of bloating and putrefaction. Conclusion: The external environment significantly influences the dynamics of decomposition of a corpse. A contextual understanding of differences in decomposition rates based on the environment is crucial for improving the accuracy of time-of-death estimation in forensic.

Keywords: *Decomposition, Natural Death, Thanatologi Forensic*

FORENSIC ODONTOLOGY: AN OVERVIEW IN DETECTION OF CRIME RATES.

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Abstract

Forensic Odontology a branch of Forensic sciences uses the skill of the dentist in personal identification during mass calamities, sexual assault and child abuse. Forensic odontology is proper handling, examination, and evaluation of dental evidence, which will be presented in the interest of justice. Keiser-Neilson defined forensic dentistry as “that branch of forensic dentistry that in the interest of justice deals with the proper handling and examination of dental evidence and the proper evaluation and presentation of dental findings. Dental identification plays an important role when identification of remains of deceased person is skeletonized, decomposed, burned or dismembered and is invalid by visual or fingerprint methods. It is mainly done with several methods that is identification of unknown remains, identification of species, DNA analysis in forensic odontology, facial construction and facial superimposition, bite marks, age estimation based on dental data, sex determination, lip prints etc. This branch not stranger to many has been growing tenfold in its potential and its ability to bring the forlorn to justice where dental remains is the only available evidence. It’s role and importance in the judiciary is fast growing and hence in-depth knowledge in this field seems more than justified.

Keywords: *forensic odontology,age estimation,bite marks, DNA analysis*

CLINICO-EPIDEMIOLOGICAL PROFILE AND DETERMINANTS OF FATAL INJURIES SUSTAINED BY PEDESTRIANS IN ROAD TRAFFIC ACCIDENTS

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Abstract

This study explores the clinico-epidemiological profile and key determinants contributing to fatal pedestrian injuries in road traffic accidents from 2022 to 2024. The primary aim is to identify the significant risk factors influencing pedestrian fatalities, including pedestrian behavior, road infrastructure, and vehicle characteristics. A retrospective cohort study design was used, analyzing data from hospitals, police reports, and traffic accident records. The findings reveal that male pedestrians, particularly those aged 30-50, are most affected, with head trauma and internal injuries being the leading causes of death. Environmental factors, such as inadequate pedestrian infrastructure and poor lighting, coupled with high-speed vehicles, significantly increase the risk of fatal accidents. Behavioral factors, such as jaywalking and alcohol consumption, also contribute to a higher likelihood of fatal injuries. The study emphasizes the importance of improving urban planning, law enforcement, and public health initiatives to reduce pedestrian fatalities. Technological interventions, such as automatic braking systems and pedestrian detection technologies, are also recommended as part of a comprehensive strategy to protect pedestrians and save lives.

Keywords: *Pedestrian fatalities, road traffic accidents, head trauma, injury determinants, urban safety, India.*

MOLECULAR FINGERPRINTING OF THE LATENT PRINT RESIDUE FOR CRIMINAL PROFILING: A REVIEW

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Abstract

The latent fingerprint residue analysis represents a significant advancement in forensic science, extending beyond traditional ridge pattern identification to encompass comprehensive molecular profiling that can reveal individuals' lifestyle patterns, health conditions, and environmental exposures. This review systematically examines findings from multiple studies that have employed sophisticated analytical methodologies to decode the chemical composition of fingerprint residues and their applications across forensic disciplines. The investigation encompasses diverse analytical approaches, including MALDI-linear ion trap-Orbitrap mass spectrometry for triacylglycerol profiling, gas chromatography/mass spectrometry for comprehensive chemical characterization, and other novel methodologies. Notable findings demonstrate that triacylglycerol profiling through latent fingerprint analysis offers potential as a non-invasive biomarker for diabetes diagnosis, providing an alternative to conventional methods. Age-related compositional differences reveal that children's fingerprints contain higher concentrations of fast-evaporating fatty acids, while adult fingerprints exhibit more stable long-chain esters, explaining the differential persistence of fingerprint residues across age groups. Metabolomic profiling studies have successfully identified specific biomarkers in sweat that correlate with various health conditions, with optimized sample preparation methods demonstrating distinct metabolite profiles between passive and active sweat collection. Detection capabilities extend to identifying smoking habits through nicotine and cotinine traces in finger-marks, while Raman spectroscopy demonstrates remarkable accuracy in detecting NSAID compounds with 94% classification accuracy and 100% specificity for drug-contaminated prints. The persistence of detectable drug traces in fingerprints exceeding 24 hours suggests significant potential for extended forensic investigations. Despite these promising developments, challenges persist in methodology standardization, contamination prevention, and sensitivity enhancement. This comprehensive review consolidates current knowledge while identifying critical research gaps that must be addressed to advance these technologies toward routine clinical and forensic applications.

Keywords: *Latent Fingerprints; Molecular Fingerprinting; Sweat Composition; Fingermarks; Fingerprint Residue.*

ADVANCEMENT IN AGE ESTIMATION IN FORENSIC SCIENCE THROUGH MOLECULAR FINGERPRINTING TECHNIQUES – A REVIEW PAPER.

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Abstract

Dactyloscopy has been utilized for personal identification from the latent fingerprint residues; offering insights into various factors of an individual such as age, sex, habits and lifestyle. Fingerprints are considered as the confirmatory evidence at the court of law as they are permanent, persistent, and unique. Various studies have been conducted to precisely identify the changes in sweat glands' activity and the chemical breakdown of fingerprint residues with respect to time. The previous studies have mainly examined specific compounds and how latent print residues degrade over time, with minimal highlight on how sweat composition varies across different age groups. However, there yet to be establish a reliable method for accurately estimating or approximating the age of the fingerprint donor. The emerging field of molecular fingerprinting, which analyses latent fingerprint sweat residue and profiles the components present within it, serves as a reliable tool for personal identification. Unlike traditional methods, like ridge density study, which only provide general trends related to age, molecular profiling allows for more precise classification based on how molecules break down over time. Fingerprint residues help improve age estimation by detecting changes in specific biochemicals, such as amino acids, lipids, and hormones, with the help of instrumentation techniques such as UV-Vis Spectroscopy, Fluorescence Spectroscopy, Photoluminescence Spectroscopy. This review highlights the potential outlook of profiling the sweat residue extracted from the latent fingerprints as a novel technique and its efficiency in estimating of the age of the fingerprint donor and addresses the technical and technological research gaps in the molecular fingerprinting technique's timeline as this method hold a potential in aiding the

forensic investigation and criminal profiling from the fingerprints retrieved from the scene of crime.

Keywords: *Fingerprints, molecular fingerprinting, age estimation, sweat compositions, spectroscopy techniques.*

A COMPREHENSIVE STUDY ON THE IMPACT OF TRADITIONAL COOKING PRACTICES ON TOXIN FORMATION IN RICE AND ASSOCIATED PUBLIC HEALTH RISKS

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Abstract

More than half of the world's population depends on rice as a basic diet, yet cultural customs vary greatly in how it is prepared. A layer of burnt or scorched rice is created by purposeful charring or extended high-temperature cooking in a number of cuisines, and is frequently prized for its distinct flavour and texture. However, these cooking methods might result in the production of harmful substances such acrylamide, polycyclic aromatic hydrocarbons (PAHs), and heterocyclic amines (HCAs), which have been linked in epidemiological and experimental research to mutagenic and carcinogenic consequences. Using data from the literature on food chemistry, toxicology, and public health, this review investigates the connection between conventional rice cooking techniques and the production of toxins. Cultural practices that are evaluated for their cultural importance and related health hazards include *tahdig* in Iran, *nurungji* in Korea, and burned rice preparations in South Asia. The review also takes into account food frequency, population exposure patterns, and the possible long-term effects of chronic ingestion. Although there is no denying the cultural significance of these dishes, research indicates that there is a need for greater knowledge, risk communication, and the creation of mitigation techniques such dietary moderation and ideal cooking conditions. This study lays the groundwork for further research on dietary toxins and public health policies while highlighting the significance of incorporating cultural context into food safety studies.

Keywords: *Rice, acrylamide, heterocyclic amines, PAHs, traditional cooking, food toxicology, public health*

A CROSS-SECTIONAL EVALUATION OF THE HISTOPATHOLOGICAL ALTERATION IN LUNGS, LIVER, AND KIDNEYS AMONG FATALITIES CAUSED BY ORGANOPHOSPHORUS POISONING

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Abstract

This study aims to assess the histopathological changes in the lungs, liver, and kidneys in cases of death due to organophosphorus poisoning. The primary objective is to understand the specific pathological alterations induced by these toxic substances and their implications for clinical and forensic pathology. Using a retrospective observational design, tissue samples from deceased individuals were examined microscopically to identify key histopathological features. The study identified significant pathological changes such as congestion, pneumonia, AcuteRespiratory Distress Syndrome(ARDS), intra-alveolar haemorrhage, and edema in the lungs. In the liver, findings included fatty changes, congestion, ballooning degeneration, cholestasis, and hepatic necrosis. The kidneys showed acute tubular necrosis, cloudy degeneration, subcapsular deposits, and glomeruli sclerosis. These findings align with previous research and underscore the severe multi-organ impact of organophosphorus compounds. The implications of these changes are profound for both clinical management and forensic investigations of poisoning cases. Accurate histopathological diagnosis is crucial for guiding treatment and establishing the cause of death. The study highlights the need for detailed tissue analysis to improve patient outcomes and ensure the integrity of forensic conclusions. In conclusion, histopathological examinations provide invaluable insights into the effects of poisoning and are essential for advancing both medical and forensic practices.

Keywords: *Organophosphorous poisoning, histopathological changes, lungs, liver, kidneys, forensic pathology*

PROJECTILE IMPACT ANALYSIS ON VARIOUS GLASS SURFACES

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Abstract

Glass is a hard, brittle, and usually transparent material that is formed by the rapid cooling of molten silica, which produces an amorphous structure. however, due to its inherent brittleness, it is highly susceptible to **impact**, which refers to the sudden transfer of energy when a moving object (projectile) strikes the glass surface—often leading to deformation, cracking, or complete failure depending on the magnitude and nature of the applied force. It is critical to know the interaction of different types of projectiles and glass surfaces to determine the pattern and likelihood of damage. Projectile shape, weight, velocity, and material play a crucial role in the fracture behavior. Blunt projectiles cause radial and concentric cracks, while sharp or pointed projectiles cause localized penetration and branching fractures. Higher velocity and greater projectiles cause greater damage, with plain glass being more prone to shattering compared to laminated and tempered glass. This research combines laboratory testing and computer replica to examine crack growth and development under various impact conditions. It identifies typical fracture modes—radial, circular, and branching cracks—and highlights the influence of stress wave transmission and edge restraint on crack development. The findings are of great value to impact-resistant glass design and use in a number of industries. These include military, transport, construction, and electronics, where impact tolerance and safety are of particular concern.

Keywords: *Glass fracture, Impact resistance, Projectile impact, Crack propagation, Tempered Radial cracks, Stress wave distribution, Ballistic testing, Material failure*

EMOTIONS IN INK - ANALYSIS OF SUICIDE NOTES USING GRAPHOLOGY

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Abstract

Handwriting can convey more than just linguistic content; it frequently reflects the writer's emotional and psychological state, particularly during times of extreme vulnerability. When people are unable to express their inner turmoil verbally, their handwriting can act as a subconscious outlet for the same which can be analysed by graphology. Graphology is the systematic analysis of handwriting which provides insight into a person's personality, mental state, and behavioural tendencies. The handwritings in suicide letters were analysed on specific graphological features like – pressure, slant, spacing, curves and letter formations. This study uses particular graphological techniques to investigate how emotions are reflected in handwriting. Understanding the behavioural, psychological, and emotional distress patterns found in suicide notes is the objective. The findings demonstrate that emotional difficulties are constantly apparent in handwriting, with specific characteristics associated with emotions of regret, impulsivity, mental breakdown, hopelessness, and emotional pain. These results can be used to spot fake suicide notes, determine the writer's mental and emotional state, and spot situations in which the note may have been written against the writer's will or under force. Furthermore, this study can help with the early detection of suicidal thoughts and depression.

Keywords: *Graphology, handwriting, suicide notes, emotional distress patterns, mental and emotional states, personality analysis.*

A REVIEW ON THE VARIATION IN HANDWRITING CHARACTERISTICS IN ADOLESCENTS SUFFERING FROM NEURODEVELOPMENTAL DISORDERS

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Abstract

In order to analyze handwriting in both healthy teenagers and those with neurodevelopmental issues, forensic handwriting examination is essential. Forensic handwriting examination plays a critical role in differentiating handwriting characteristics between healthy adolescents and

those diagnosed with neurodevelopmental disorders. Conditions such as Attention-Deficit/Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD), and their co-morbid presentation influence the motor and cognitive components required for handwriting. This review explores the distinct handwriting features observed in adolescents with these conditions, emphasizing their forensic significance. Handwriting development is a complex process involving motor coordination, visual-motor integration, and executive functioning domains often impaired in neurodevelopmental disorders. Individuals with ASD often demonstrate rigid, repetitive writing patterns, inconsistent letter sizing, and spatial disorganization, whereas those with ADHD frequently exhibit impulsive strokes, fluctuating pressure, and irregular letter forms. The co-existence of both disorders can exacerbate these features, complicating forensic interpretation. Such handwriting irregularities, if unrecognized, may interfere with document authentication, signature verification, and authorship attribution. Therefore, it can be concluded that it is important to incorporate such clinical insights into forensic handwriting analysis to distinguish between unintentional neurological variability and intentional modifications. Awareness of neurodevelopmentally influenced handwriting deviations is essential for improving accuracy and objectivity in forensic document examination, ultimately enhancing the evidentiary value in legal proceedings.

Keywords: *Forensic handwriting analysis (FHA), Neurodevelopmental disorders (ND), Attention-Deficit/Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD),Handwriting characteristics (HC).*

FORENSIC ANALYSIS OF CLASS CHARACTERISTICS OF ENGLISH HANDWRITING ACROSS DIVERSE POPULATION

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Abstract

Handwriting analysis plays a crucial role in forensic investigations, offering valuable insights for writer identification and profiling. This systematic review explores how class characteristics of English handwriting vary across different populations and how these variations can assist in forensic applications. Drawing from peer-reviewed research and forensic reports, this study examines key handwriting features—such as slant, spacing, pen pressure, baseline alignment, and letter size—while highlighting the influence of demographic factors like age, gender, and cultural background. Our findings reveal consistent regional and group-specific differences in handwriting, shaped significantly by cultural norms and individual demographics. Notably, features like pen pressure and slant often correlate with gender, while spacing and size are influenced by both age and cultural context.These observations reinforce the forensic value of handwriting characteristics not just for writer identification, but also for narrowing down a suspect's demographic profile. The study

underscores the evolving potential of handwriting examination as a reliable tool in forensic science, capable of enhancing the accuracy of document analysis and contributing meaningfully to investigative procedures.

Keywords: *Forensic handwriting, class characteristics, writer profiling, English handwriting, population-based variation*

A REVIEW ON RELATIONSHIP BETWEEN HANDWRITING CHARACTERISTICS AND LIFESTYLE DISEASES

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Abstract

The prevalence of lifestyle diseases such as hypertension and diabetes has risen in recent years, underscoring a concerning trend. The growth in the incidence of lifestyle diseases highlights the pressing need for continued research to determine their effect on neuromuscular movements. Previous studies suggest that these diseases can cause cognitive impairments, manifesting as difficulties in motor skills. Handwriting, being a fine motor skill, is controlled by complex neuromuscular coordination and cognitive functions. Any impairment in these domains due to lifestyle diseases can significantly affect an individual's writing patterns. Variations in handwriting due to lifestyle diseases can influence questioned document analysis, signature verification, and authorship attribution in forensic investigations. Since, forensic document examiners rely on handwriting consistency to authenticate documents, detect forgeries, and establish authorship, when an individual's handwriting is affected by an underlying medical condition, it can pose challenges in forensic examinations. Therefore, the present review article focuses on establishing the relationship between handwriting characteristics and life style diseases. It can be suggested that a strong association prevails between handwriting and lifestyle diseases; however, a more definitive approach is required to establish this relationship with a higher degree of certainty. The integration of machine learning algorithms and statistical methods can enhance the reliability of handwriting analysis in forensic contexts, providing a more objective and scientifically robust framework for identifying handwriting alterations linked to these diseases. By leveraging advanced computational techniques, forensic experts can develop predictive models that distinguish between pathological handwriting changes and intentional modifications, thereby improving the credibility of forensic handwriting examinations.

Keywords: *lifestyle Diseases (LD), Forensic Handwriting Analysis (FHA), Neuromuscular Coordination (NC), Handwriting Variation (HV), Machine Learning (ML)*

FORENSIC PSYCHOLOGY IN INDONESIA: ADDRESSING THE GAPS IN TRAINING AND APPLICATION

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Abstract

This study explores the application of forensic psychology in Indonesia, focusing on the limitations posed by its reliance on paper-based assessments such as interviews and psychological evaluations, which are often conducted by clinical psychologists. A literature review was conducted to analyze the differences between clinical and forensic psychology, highlighting why clinical psychologists may not be well-suited for forensic roles. The findings reveal that clinical psychologists, trained primarily in therapeutic interventions, may lack the objectivity and specialized skills required in forensic settings, such as cognitive interviewing, deception detection, and memory analysis. This gap is further emphasized by the potential for bias stemming from a therapeutic mindset, which contrasts with the fact-focused nature of forensic work. The study underscores the need for targeted training, collaboration with law enforcement, and the incorporation of evidence-based forensic techniques to enhance investigative accuracy and ensure fair legal outcomes in Indonesia.

Keywords: *forensic psychology, clinical psychology, investigative methods, bias in evaluation*

EXPLORING HERITABILITY OF LIP PRINT PATTERNS: A THREE-GENERATION STUDY USING AFCHAR-BAYAT AND KASPERZAK CLASSIFICATIONS IN SOUTH INDIA

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Abstract

The study of lip prints has emerged as a useful tool for crime scene investigation and personal identification in criminal science. This study explores the cheiloscopic patterns among the South Indian (Chennai) population, applying the Afchar-Bayat classification system across

consecutive three generations to identify potential novel patterns and assess the influence of genetic .A cross-sectional analysis was conducted on a sample size representative of three generational cohorts of about 30 families comprising 110 individuals. The lips were examined for characteristic variation and their inheritance trends. The results revealed distinct patterns which are unique to this area such as “S” shape inverted pentagon, A leaf, inverted “s” shape and alphabetic “E” and the numeric character “8”. Additionally previously undocumented subtypes in the Afchar-Bayat classification system were identified suggesting the need for its expansion. These findings contribute to the growing database of cheiloscopic patterns and highlight the importance of regional and generational scrutiny in forensic science offering enhanced tools for individual identification.

Keywords: *Forensic Chelioscopy, Afchar-Bayat classification, Novel patterns, Personal identification, South Indian population.*

NOVEL STUDY ON THREATENED ORCHIDS OF DENDROBIUM BY USING PHYTOCHEMICAL, ANTIOXIDANT, AND ANTIMICROBIAL METHODS

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Abstract

Orchidaceae is one of the most diverse families in flowering plants, with 600–800 genera comprising 25,000–35,000 species worldwide and 1,331 species across 158 genera in India. The family has gained attention for its visual appeal and significance in horticulture,

medicine, food, scent and cosmetics. These properties have subjected orchids to extreme pressure from illegal trafficking. Consequently, threatened species are protected by CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), IUCN (International Union for Conservation of Nature) and EPA (Environment Protection Act), 1985. Dendrobium (Den.) is one of the largest and most demanded genera of orchidaceae. Limited information exists on two selected *Dendrobium* species for research. Leaves of two protected *Dendrobium* orchids, *Den. 'Sonia Earsakul'* and *Den. 'Singapore white'* were powdered and extracted with methanol. The extracts were tested for phytochemical profiles, antibacterial potency against *Escherichia coli* and *Staphylococcus aureus* using Agar Well Diffusion Method, MIC (Minimum Inhibitory Concentration) estimation, antioxidant activity using FRAP (Ferric Reducing/Antioxidant Power assay) and functional group determination using FTIR (Fourier Transform Infrared Spectroscopy). Standard tests revealed bioactive substances including alkaloids, flavonoids, phenols, glycosides, and steroids. The methanolic extracts showed moderate to strong antibacterial activity; *Dendrobium singapore white* was more effective against *S. aureus*, while *Dendrobium sonia earsakul* was more effective against *E. coli*. MIC values confirmed bacterial suppression at12.5 mg/mL. Both extracts showed significant FRAP values, though lower than ascorbic acid. FTIR spectra identified functional groups corresponding to polyphenols, terpenes, aldehydes, and other bioactive components. Because of their diverse phytochemical compositions, the methanolic extracts of *D. sonia earsakul* and *D. singapore white* show encouraging antibacterial and antioxidant qualities. These results highlight the significance of protecting these endangered orchid species and lend credence to their possible usage in pharmaceutical applications. The study emphasizes the necessity for sustainable consumption techniques and establishes a framework for future investigations into the therapeutic potential of hybrid orchids.

GENETIC DIVERSITY OF Y STRS- AN OVERVIEW IN DIFFERENT POPULATIONS OF HARYANA

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Abstract

Every person in the world has remarkably high level of polymorphism in the sequence of their DNA, which they inherit from their biological parents.About 99.9% of human DNA sequences are same in every person, except for monozygotic twins, yet there are enough variations present

which allow for individual identification. This feature makes identification possible at the molecular level. India is well known for its distinctive indigenous cultural, linguistic, and traditional diversity. This has enhanced the interest of researchers who are working to uncover the genetic basis of this diversity using a range of genetic markers, including autosomal, X chromosomal and Y chromosomal DNA markers. Y STR diversity in Haryana reflect a complex interplay of migration, endogamy and socio-culture structure. Haryana's Y STR chromosomal landscape thus provides a valuable window into North Indian paternal genetic history and its implication for Forensic Science. This review highlights the importance of Y STR markers used to determine the genetic affinities in different population of Haryana.

Keywords: *DNA Profiling, Y STR Markers, Forensic Science, Population Genetics, Genetic Diversity.*

HANDWRITING CHARACTERISTICS IN AUTISM SPECTRUM DISORDER: A SYSTEMATIC REVIEW AND FORENSIC IMPLICATIONS

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Abstract

This systematic review synthesizes research from 2015 to 2025 on handwriting features observed in individuals with Autism Spectrum Disorder (ASD), with a specific lens on their implications for forensic document examination. The core objective is to examine how atypicalities across motor, perceptual, and cognitive domains in individuals with ASD manifest in handwriting, and how these traits may be misinterpreted in forensic assessments.Following PRISMA guidelines, a systematic search was conducted across two major databases, resulting in the inclusion of over 30 peer-reviewed studies. The handwriting characteristics identified were categorized into four analytical domains: spatial (e.g., irregular spacing and misalignment), temporal (e.g., reduced fluency and inconsistent rhythm), kinaesthetic (e.g., variable pen pressure and tremulous strokes), and cognitive (e.g., poor planning and execution).Findings indicate that individuals with Autism Spectrum Disorder (ASD) exhibit consistent handwriting anomalies, such as macrographia, excessive pen lifts, unsteady line quality, and slow writing speed, primarily stemming from deficits in motor planning, visuomotor coordination, and executive functioning. Importantly, these features can mimic signs of forgery or disguise, posing challenges for forensic handwriting examiners.The review highlights the necessity for forensic experts to consider neurodevelopmental conditions like ASD when interpreting handwriting evidence. A nuanced understanding of these traits is essential to avoid misclassification and to promote equitable forensic practices.

Keywords: *Autism Spectrum Disorder, Handwriting Analysis, Forensic Document Examination, Macrographia, Motor Impairments*

DEVELOPMENT AND VALIDATION OF A SIMPLE AND ROBUST LC-ESI SINGLE QUADRUPOLE MS-BASED METHOD FOR COCAINE DETECTION IN HUMAN URINE

Abstract

Purpose – Advanced mass spectrometric platforms such as LC-MS/MS or QToF are considered reliable for high-sensitivity detection of cocaine in human urine. However, these instruments are often not accessible to routine forensic laboratories due to financial and logistical constraints. The presented study aims to develop and validate a cost-effective, rapid and environmentally suitable method using a single quadrupole-based LC-MS technique for the detection of cocaine in human urine. *Method* -The method employs an Acclaim C18 Column (150 × 3 mm, 5 µm) with a retention time of cocaine at 5.18 minutes within a total runtime of 8 minutes. Optimal chromatographic separation was achieved with 10 mM Ammonium Formate with 0.1 % Formic acid and Acetonitrile with 0.1% formic acid, with a flow rate of 1000 µl/min and an injection volume of 5 µL. *Results* - The calibration demonstrated strong linearity (0.5–25 µg/ml; $R^2 = 0.9959$), with LOD and LOQ of 0.24 and 0.81 µg/ml, respectively. The method demonstrated excellent accuracy (105.8%) and precision (mean %RSD = 7.42%), along with 0% RSD in retention time repeatability. Matrix effects (92.96%) and recovery (up to 71.23%) confirm suitability for forensic toxicology. *Conclusion* - Research groups and forensic laboratories operating under budget constraints often rely on cost-effective yet dependable instrumentation, the presented method for cocaine analysis providing a practical solution without requiring complex or high-end MS systems.

Keywords - *LC-SQMS, cocaine, urine, forensic toxicology, method validation, green chemistry*

THE DEVELOPMENT OF DNA DATABASES FOR FORENSIC PURPOSES WORLDWIDE OVER THE PAST 30 YEARS

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Abstract

The primary goal of forensic DNA databases is to detect offenders. The world's first DNA database was launched in the United Kingdom in 1995. Subsequently, such databases were established over 25 years ago in most Western European countries, as well as in the USA and Canada. Similar databases have also been introduced in other countries, such as Brazil (in 2013), Ireland (2015), and Italy (2016). To determine the development of DNA databases over the past 30 years, an analysis of reports from various institutions managing DNA databases was conducted. The results indicate a significant increase in the number of DNA profiles of

suspects and convicted individuals in most databases. At the end of 2023, the largest DNA databases were recorded in the United Kingdom (8.82% of UK population was registered in database), France (8.66%) and the United States (6.5%). However, in some countries the number of profiles of people remains relatively stable, and in Germany and Switzerland, for example, the number of DNA data has even decreased. Notably, in such databases, a similar level of positive matches (person-trace) was recorded. This suggests that it is more appropriate to have genetic data for current offenders than to store all data indefinitely, which is a symptom of invasion of privacy. The main factors affecting the volume of DNA databases are inclusion and removal criteria or policing priorities. Legal-comparative research in selected EU countries, US and Canada revealed completely different frameworks and approaches to DNA databasing. In some countries (e.g., the USA and UK), DNA databases can be considered the primary tool for comparing profiles in ongoing cases. In others (e.g., Poland, the Netherlands, and Belgium), they serve as a tool for identifying perpetrators in unsolved cases, as profiles are entered only after obtaining results from DNA analysis within a case.

Keywords: *DNA database, DNA profile, retention time, match, identification*

ENVIRONMENTAL CHALLENGES AND FORENSIC APPROACHES IN MASS DISASTER VICTIM IDENTIFICATION

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Abstract

Mass Disaster Victim Identification is a complex, multidisciplinary process that becomes indispensable when large-scale natural or human-made catastrophes causes multiple fatalities. Alongside its forensic functions, DVI fulfills a humanitarian purpose also i.e safeguarding the dignity of victims, providing a closure to their families, and ensuring recognition under both national and international legal systems. The rising frequency of climate-related hazards, pandemics, industrial accidents has created an urgent demand for a more effective and resilient DVI frameworks. During the 2025 monsoon season, Himachal Pradesh, a hilly state with 75 lakh population has experienced an unprecedented wave of disasters, more than forty cloudbursts, over eighty landslides, numerous flash floods, the flow of the rivers increased sharply which has posed a additional challenge to the rescue operations, causing more than hundred deaths in the state plus large scale infrastructure destruction. Districts like Mandi, Kullu, where flash floods disrupted highways, destroyed farm lands, and has isolated the entire communities, explains the forensic and logistical challenges in recovering and identifying the victims. This paper will evaluates the global practices relating to DVI protocols and compare them with India's institutional arrangements under the Disaster Management Act 2005 and the guidelines of the National Disaster Management Authority. Incidents such as 9/11 terrorist

attack, Kozhikode Airplane crash, Pahalgam Terrorist attack, monsoon related cloudbursts and landslides in Himachal Pradesh demonstrates the operational difficulties and lessons learnt from the past crises. In spite of the International framework which have strong preparedness, India continues to face systemic challenges such as resource shortages, degraded human remains and coordination gaps among the various agencies. Ethical considerations in the dignified handling of the deceased victims remains central. This paper will also suggests the future DVI strategies and to integrate scientific progress with humanitarian values, ensuring accurate, timely and compassionate disaster response.

Keywords: *Disaster Victim Identification, forensic science, environmental, destruction, monsoon season*

QUANTITATIVE PMI ESTIMATION FROM HEPATIC PROTEIN DECAY: ASSAY-VALIDATED EVIDENCE

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Abstract

Accurate determination of the post-mortem interval (PMI) remains a central challenge in forensic science. Conventional approaches, such as algor mortis, rigor mortis, and livor mortis, are widely applied but often compromised by environmental and physiological variability. Protein degradation kinetics offer a promising alternative, providing quantifiable molecular changes that correlate reliably with elapsed time since death. Using a time-series design, hepatic tissue (*Gallus gallus domesticus*) was sampled at 0, 6, 12, 24, 48, 72, and 96 h post-mortem. Immediately after collection, tissue was cryo-arrested to suppress autolysis. Homogenates were prepared; soluble protein was quantified by two orthogonal colorimetric assays and proteolysis was profiled by SDS–PAGE with visual/densitometric assessment. Both assays demonstrated a statistically significant, monotonic, time-dependent decline in total protein, while SDS–PAGE showed progressive loss of band intensity and number across intervals, consistent with broad-spectrum proteolysis. These convergent readouts support hepatic protein decay as a quantitative marker for PMI estimation and provide assay-validated evidence suitable for model fitting (e.g., exponential/kinetic decay) in the full analysis. The combined assay evidence underscores that hepatic protein decay exhibits predictable kinetics suitable for quantitative PMI estimation. This biochemical approach not only enhances

objectivity over traditional methods but also provides a foundation for integration with computational models, such as machine learning, to further improve reliability and precision in forensic casework.

Keywords: *Post-mortem interval, hepatic protein decay, quantitative biomarker, biochemical assay, SDS-PAGE.*

ANALYSIS OF BEE STING VENOM: FORENSIC MEDICINE AND ENTOMOLOGY PERSPECTIVES ON TOXICOLOGICAL EFFECTS AND ITS IMPLICATIONS IN DEATH INVESTIGATIONS

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Abstract

Bee Venom contains certain biologically active peptides and enzymes like melittin, apamin, phospholipase A2, and hyaluronidase. These components contribute to wide range of effects in human from pain and local inflammation to major toxic and allergic reactions. In certain forensic investigations that involves or multiple stings, these bee venom can lead to asphyxiation, cardiovascular collapse, coma and even death. Entomological perspectives, explains the understanding of bee behaviour, habitat and seasonal activity patterns aids in the contextual evaluation of death scenes. Entomological evidence can help determine the postmortem interval (PMI) and reconstruct events surrounding the incident, particularly in outdoor environments. Forensic Medicine perspectives, explain the signs of hyper envenomation that can be crucial for cause of death determination. Autopsy findings in fatal bee sting cases may include facial or airway swelling, pulmonary edema, internal organ congestion, or signs of cardiovascular collapse. In allergic individuals, even a single sting can trigger a rapid hypersensitivity response, resulting in death within minutes, which may be mistaken for other natural causes if not properly investigated. The toxicological reports and detection of certain venom-specific antibodies or diagnosis related to the same can help in diagnosis. This study explores the clinical and forensic implications of bee sting venom, emphasizing its potential role in unexplained or sudden deaths. The methodology of this is study is to analyse the components in the bee venom after extraction and to find out the toxicological effects on human body. It can be used for entomological study of ante-mortem and post-mortem death changes. This interdisciplinary approach combining forensic pathology, toxicology, and entomology enhances the accuracy and depth of medico-legal investigations. The study also highlights the need for increased awareness and documentation of insect-related deaths, which are often underreported or misdiagnosed. Recognizing bee sting

envenomation as a potential cause of death can have significant implications for public health, legal accountability, and preventive measures.

Keywords: *Bee venom, Forensic Medicine, Entomology, Toxicology, Post-mortem, Post-mortem interval (PMI)*

ADVANCING SIMULTANEOUS OPIOID DETECTION: OPTIMIZATION OF EXTRACTION EFFICIENCIES AND VALIDATION OF AN LC-MS METHOD FOR ANALYZING ILLICIT AND PRESCRIPTION OPIOIDS OF MISUSE IN HUMAN URINE

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Abstract

Purpose The increasing prevalence of misuse of illegal and prescribed opioids, such as fentanyl, methadone, and heroin, has heightened the demand for reliable and economical toxicological screening techniques. Conventional procedures typically depend on enzymatic hydrolysis and tandem mass spectrometry (MS/MS), which restricts their applicability in resource-limited forensic environments. This research focused on the development, optimization, and validation of a reliable LC-MS method employing a single quadrupole mass spectrometer for the concurrent quantifying of eight opioids in urine. Methods Solid-phase extraction with enzymatic hydrolysis, Salt-Assisted Liquid-Liquid Extraction, and a modified SPE with passive chemical hydrolysis were the three extraction techniques that were comparatively evaluated. Analyte stability (up to 96 h), carryover, matrix effects, linearity, precision, and accuracy were all evaluated throughout the method validation process, which was carried out in accordance with ICH criteria. Results Recoveries by modified SPE with passive chemical hydrolysis at 54°C for 6 h were the most consistent (87.0 ± 2.1% to 114.4 ± 3.0%), with heroin yielding a slightly lower recovery (78.0 ± 3.4%) because of partial hydrolysis to 6-MAM and morphine. The assay demonstrated good accuracy (RSD < 16.8%), acceptable bias (–13% to +18%), and outstanding linearity (R2 = 0.991–0.998). Only heroin and 6-AC exhibited little suppression, with matrix effects falling between 80 and 120 %, suggesting little ion enhancement or suppression. 0.5 µg mL-1 and 0.3 µg mL-1 were the LOQ and LOD, respectively. There was not any noticeable interference or carryover. Conclusions The optimized LC-MS approach provides a reliable, cost-effective, and selective alternative for the analysis of opioids in urine. It is particularly appropriate for regular forensic applications in low-resource labs because to its enzyme-free extraction and use of a single quadrupole mass spectrometry.

Keywords: *Method validation . Single Quadrupole LC-MS . Urine Opioid detection . Forensic toxicology, Passive hydrolysis-SPE*

ROLE OF WRITING SCRIPTS IN DEVELOPMENT OF HANDWRITING CHARACTERISTICS IN A POPULATION

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Abstract

Handwriting is a unique form of communication that combines motor skills, cognitive processes, and personal style. This individuality, shaped by cultural, educational, and environmental factors, makes handwriting an essential subject of study in forensic science. Internal factors such as mood, energy levels, and physical conditions, alongside external influences like teaching methods, cultural traditions, and writing tools, all impact handwriting. Forensic handwriting analysis focuses on individuality and class characteristics to determine authorship and authenticity. Cultural and ethnic nuances further enhance the analysis, as different groups exhibit distinctive writing traits. Techniques like script comparison, handwriting analysis under varying conditions, and the examination of ink and paper contribute to forensic investigations. These methods, enriched by interdisciplinary approaches, enable experts to accurately analyze handwritten documents, resolving legal and criminal cases with enhanced precision.

Keywords: *Handwriting analysis, Forensic document examination, Individuality in handwriting, Class characteristics, Scripts*

MATRIX INTERFERENCE CHALLENGES IN NUTRITIONAL SUPPLEMENT TESTING: A FORENSIC ANALYTICAL PERSPECTIVE

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Abstract

The forensic analysis of nutritional supplements for WADA-banned substances presents unique challenges due to complex and highly variable matrices. Supplements often contain plant extracts, proteins, excipients, and other components that interfere with mass spectrometry-based detection methods, leading to issues such as ion suppression, signal enhancement, and co-elution. These matrix effects can compromise method sensitivity, specificity, and reliability which are critical factors in forensic toxicological analysis. This study highlights findings from the development of a multi-residue LC-MS and HRMS-based screening method for WADA-prohibited Stimulants. We discussed observed matrix interferences across diverse supplement forms and demonstrate how these can lead to false positives or negatives. Optimized sample preparation protocols are evaluated for their effectiveness in minimizing these interferences. With growing concerns over supplement-related doping cases, the need for validated, matrix-aware detection and identification methods is more urgent than ever. This work emphasizes the importance of analytical transparency, robust quality control, and reliable testing standards to ensure defensible results in anti-doping investigations.

Keywords: *Forensic Analysis, Matrix effects, nutritional supplements, WADA, LC-MS, HRMS, Anti-doping, supplement testing.*

INTERCEPTING NOVEL PSYCHOACTIVE SUBSTANCES: A GC-HRMS METHOD FOR INTEGRATED SCREENING, CONFIRMATION, AND QUANTITATION IN FORENSIC DRUG ANALYSIS

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Abstract

The rising misuse of novel psychoactive substances (NPS) has become a significant challenge for forensic laboratories worldwide. These compounds, known for their structural diversity, rapid emergence, and typically low concentrations in complex samples, demand advanced analytical approaches for accurate identification and quantification. This study introduces a validated and versatile gas chromatography–high-resolution mass spectrometry (GC-HRMS) method, using an Orbitrap detector with both electron ionization (EI) and chemical ionization (CI) modes, for comprehensive screening, confirmation, and quantitation of novel pscychoactive substances. The GC-EI-Orbitrap HRMS approach offers exceptional full-scan high resolution (60,000 FWHM) and remarkable mass accuracy (within 2 ppm), allowing reliable identification of analytes through spectral library matching. Particularly effective for synthetic cathinones and phenethylamines, this method consistently produced characteristic fragment ion patterns with minimal interference from sample matrices. For quantitation, CI combined with parallel reaction monitoring (PRM) was employed, preserving molecular ions and enhancing selectivity. Calibration curves showed excellent linearity ($R^2 > 0.995$) across a 1–100 ng/mL range, with detection limits as low as 2.5 ng/mL. The method was applied successfully to both spiked samples and actual case samples, underscoring its suitability for routine forensic drug analysis. Its dual capacity for broad retrospective screening and targeted quantification makes the GC-Orbitrap platform a powerful tool to tackle the evolving NPS landscape, particularly in regions like India where drug-related offenses are on the rise. This work demonstrates the platform's promise in helping forensic laboratories stay ahead of emerging threats.

Keywords: *Novel Psychoactive Substances (NPS), Gas Chromatography–High-Resolution Mass Spectrometry (GC-HRMS), Mass Accuracy, Synthetic Cathinones, Forensic Drug Analysis*

SYNTHESIS AND CHARACTERIZATION OF RHODAMINE B LOADED CHITOSAN NANOPARTICLES FOR FORENSIC APPLICATION

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Abstract

Fluorescent chitosan nanoparticles were synthesized via ionic crosslinking of chitosan with sodium tripolyphosphate. Rhodamine B, a fluorescent dye, was successfully incorporated into the nanoparticles through electrostatic interactions and possible covalent bonding between the carboxyl groups of Rh-B and the primary amine groups of chitosan, forming Rh-B-loaded chitosan nanoparticles. Although chitosan has been extensively applied in medicine, pharmaceutics, and food packaging, its forensic applications—particularly for latent fingerprint detection - remain underexplored. Nanoparticles were optimized and synthesized at 0.2 M TPP concentration, using a CS:TPP ratios. The prepared Rh-B chitosan nanoparticles were characterized using Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), Raman spectroscopy, and UV–Vis spectroscopy. FTIR confirmed successful interactions among chitosan, TPP, and Rhodamine B. SEM analysis revealed uniform particle morphology with consistent size distribution. The nanoparticles exhibited strong and stable orange fluorescence under UV illumination. The observation shows the potential of fluorescent nanoparticles as a novel fluorescent agent for forensic visualisation of latent fingerprints.

Keywords : *Forensic Science, Nanoparticle, characterisation, Chitosan, Fluorescence, tripolyphosphate.*

EVALUATION OF SEASONAL VARIATIONS IN SOIL OF ANDHRA PRADESH BY USING STEREOMICROSCOPE WITH PYTHON BASED IMAGE ANALYSIS

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Abstract

This study investigate variabilities during all the three seasons in the physical characteristics of soil particles from the four major districts of Andhra Pradesh: Visakhapatnam, East Godavari, Kurnool, and Tirupati using stereomicroscopy and sophisticated Python-based image analysis. During the monsoon, winter, and summer seasons, soil samples were gathered from Agricultural area. Minute detailing images of soil color, particle size, shape, and density

were obtained through stereomicroscopic imaging. A Python-based analysis pipeline that made use of OpenCV, NumPy, scikit-image, and TQDM enabled precise textural and structural data extraction. High levels of erosion and moisture were indicated by the rounded shapes, finer grains, and darker colors of monsoon soils. Summer soils had coarser particles, angular shapes, and higher densities due to the dry, oxidizing conditions. Winter samples had intermediate features. Color changes were interpreted using Munsell soil color charts. By reaffirming the forensic value of soil evidence, this multidisciplinary approach upholds Locard's Exchange Principle. The non-destructive approach offers trustworthy comparisons of trace evidence. The results highlight the importance of seasonal and site-specific variations in forensic soil profiling. The study shows how environmental factors shape soil characteristics over time. These discoveries significantly increase the forensic value of soil in criminal investigations. According to the study, computer analysis and stereomicroscopy should be the standard for examining soil trace evidence.

Keywords: *Soil examination, Stereomicroscope, Python, Monsoon,Winter,Summer,Trace Evidence*

FORENSIC MICROBIAL SIGNATURES: COMPARATIVE ANALYSIS OF GUT MICROBIOTA IN NAGA AND MEITEI COMMUNITY

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The composition of gut microbiota is known to be host-specific, and the presence or absence of certain key microbial taxa may serve as distinguishing features in population studies or forensic investigations. Fecal traces and their associated microbial communities recovered from crime scenes, as well as pubic microbiomes, can be utilized for individual or group source tracking. We employed Illumina MiSeq-based 16S rRNA gene amplicon sequencing for gut microbiota profiling, complemented by liquid chromatography–mass spectrometry (LC-MS) for metabolomic analysis. Differential abundance analysis was conducted to assess statistically significant differences in bacterial taxa and metabolites between individuals of Naga ethnicity and younger Meitei individuals. Our findings revealed two key bacterial taxa that were significantly enriched in Naga and Meitei community, highlighting their potential as forensic microbial signatures capable of distinguishing between two ethnicities.

Keywords: *Gut microbiota, forensic microbiome signatures, ethnic*

SEASONAL VARIATIONS IN THE ELEMENTAL COMPOSITION OF WETLAND SOIL BY XRF

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Abstract

Wetlands are the important ecosystem on the Earth for developing the sustainability in environment. The quality of soil present in these habitats have been deteriorated because of pollutants and industrial wastes being carried in the soil. The seasonal variations (monsoon and winter) and comparison of trace elements at two different depth (0-10cm and 11-20cm) of wetland soil from three selected wetlands (Harike, Kanjli and Ropar) of Punjab region categorized under Ramsar Convention were considered for the research. The results obtained by X Ray fluorescence (XRF) spectroscopy showed the presence of elements such as Aluminum (Al), Silicon (Si), Copper (Cu), Zinc (Zn), Gallium (Ga), Arsenic (As), etc indicating the effect of industrial effluents in the nearby regions of the wetlands. Further statistical technique was employed to analyze and compare the variations in trace elements with respect to different seasons at different depths. This study will be helpful in understanding the effect of industries spreading its effluents in the soil along with the flow of water and developing the strategies for management and conservation of such habitats.

Keywords: *wetland, soil, elements, seasons, ecosystem, pollution*

FORENSIC INVESTIGATION ON BLUE STAMP PAD INKS USING UV-VISIBLE SPECTROSCOPY

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Abstract:

Stamp pad inks are generally used in various legal documents particularly in contracts, wills, declarations, cheques and postal cards etc. These inks and stamps used to provide authenticity and credibility to document. Any alteration in stamp inks can dispute the document or question its authenticity. To establish the authenticity of a document, examination of stamp pad inks can play a pivotal role in forensic investigation for the purpose of legal procedures. Various techniques have been used in past to evaluate stamp pad inks such as Thin-Layer Chromatography (TLC), High-Performance Liquid Chromatography (HPLC), Gas Chromatography- Mass Spectroscopy (GC-MS), Attenuated Total Reflectance-Fourier Transform Infrared Spectroscopy (ATR-FTIR), and Raman Spectroscopy. In this study, 10 samples (B1 to B10) of blue stamp pad inks of different brands were collected from Punjab region of Northern India. Four different substrates were utilized including A4 sheet, bond paper, ivory paper, and postcard envelop to analyse the effect of substate on stamp pad inks. On the basis of visual peak asesement two samples of inks were selected for substrate study (B3, B7). The result revealed that blue stamp pad ink samples were distinguished from each other with a discriminating power of 88.88% using visual examination and UV-Vis. Spectra.

Keywords: *Stamp Pad Inks, Forensic Science, UV-Visible Spectroscopy, Documents, Discrimination.*

A CRITICAL REVIEW ON MODERN TECHNIQUES OF FINGERPRINT DEVELOPMENT AND ENHANCEMENT

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Abstract

Fingerprints are considered crucial evidence discovered at the crime scene. These are considered the most reliable tools for identifying individuals in forensic science. Due to their uniqueness and permanence, they are widely accepted in legal systems. This article discusses latent prints that are not visible to the naked eye and require several powder and chemical methods for their development. Over the past decades, significant advancements have been made in fingerprint development methods, ranging from traditional powder dusting to sophisticated modern approaches utilizing chemical, physical, and optical principles. The methods for the development of latent prints include powder methods, iodine fuming method,

ninhydrin method, physical developer, cyanoacrylate method, gentian violet, SPR (small particles reagent), vacuum metal deposition, DFO(1,8-diazofluoren-9-one), and IND(1,2-indanedione). Previous studies have shown that, apart from the above-mentioned methods for fingerprint development, several green methods are also used, which are both human and environmentally friendly. The green and non-toxic alternatives include Curcumin, Genipin, Lawsone, Isatin, and its derivatives. Due to advancements in nanotechnology, nanoparticles are currently being used in the development of fingerprints. The sensitivity and reliability of nanoparticles make them an important tool for fingerprinting in forensic science. The review explores the potential of using nanoparticles in the development of fingerprints and their enhancement. Nanoparticles have several advantages that include non-destructive application and their ability to reveal the prints with minimum residue. Previous studies had shown the use of various nanomaterials such as nano-powders, quantum dots, gold and silver nanoparticles, silica-based nanocomposites, fluorescent carbon nanoparticles, rare earth-based luminophores, Copper Oxide nanoparticles, and Iron oxide nanoparticles. This review highlights the comparative evaluation of various methods used for the development of fingerprints in order to determine which method is the most cost-effective, environmentally friendly, and produces better results.

Keywords: *Forensic Science, Fingerprint development, Latent fingerprints, Nanoparticles, Green methods*

IMPACT OF EDUCATIONAL STRESS ON MENTAL HEALTH IN YOUNG ADULTS

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Abstract

Educational stress profoundly affect the psychological well-being of young adults, increasing their vulnerability to anxiety, depression, and functional impairments. Recognizing the critical importance of mental health in enabling young adults to achieve academic and personal success, this study aimed to assess the impact of educational stress on mental health among young adults in the Malwa region of Madhya Pradesh. A cross-sectional study was conducted with 400 participants aged 18-26 years (mean = 20.23, ± SD = 1.96), recruited through random sampling using an online questionnaire developed based on standardized Psychometric tools. Data were analyzed using chi-square tests to examine associations. The results indicated a high

prevalence of educational stress across the sample, with female participants experiencing higher levels of exam anxiety, physical stress symptoms, and depressive tendencies, while male participants reported greater substance use and interpersonal conflict. These findings highlight the urgent need for tailored mental health interventions and resilience-building strategies to reduce educational stress and promote psychological well-being among young adults in this region.

Keywords: *Educational Stress, Young Adults, Mental Health, Depression and Anxiety, Resilience Interventions.*

HUMAN IDENTIFICATION BEYOND DNA: THE ROLE OF BIO-CULTURAL MARKERS FOR FORENSIC INVESTIGATION

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Abstract

Introduction: - India, with its vast population and rich cultural diversity, faces growing challenges in crime investigation, particularly in human identification. While DNA-based identification remains the most accurate and reliable method, it is often costly, time-consuming, and sometimes impractical especially in cases where DNA is degraded, contaminated, or unavailable, such as in natural disasters, fire incidents, or mass casualties. This study analyses the integration of bio-cultural marks in forensic anthropology and forensic science to help develop more holistic identification techniques.Research Objectives: -This study aims to explore the role of bio-cultural markers as alternative or supplementary tools to DNA in forensic human identification, particularly in resource-limited or DNA-compromised scenarios.Methods: -The research is based on a qualitative review of secondary data and relevant case studies. It analyzes physical and cultural traits including cranial and dental morphology, musculoskeletal markers, tattoos, religious marks, anthropometric data, and linguistic features using forensic anthropological and scientific frameworks.Results: -The study finds that bio-cultural markers like fingerprints, skeletal changes from habitual activities, dental traits, and culturally-specific body modifications can provide crucial identification information. These markers are especially useful in supporting or replacing DNA analysis when it is inadequate. Conclusions: -Bio-cultural markers serve as cost-effective, accessible, and culturally informative tools in human identification. Integrating them with conventional forensic methods enhances the scope of forensic science. This interdisciplinary approach strengthens identification practices and improves outcomes in diverse forensic settings.

Keywords: *Forensic Anthropology, Bio-Cultural marker, DNA, Human identification, Cultural characteristics.*

BLUE BALLPOINT PEN INK DISCRIMINATION USING ATR-FTIR AND PCA: INFLUENCE OF SUBSTRATE THICKNESS AND SURFACE CHARACTERISTICS

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Abstract

Discriminating between ballpoint pen inks with similar compositions is a constant challenge in questioned document examination, especially when using non-destructive methods. The impact of the substrate on the effectiveness of analytical methods is still not well understood. This study investigates how paper thickness and surface properties affect the differentiation of blue ballpoint pen inks through Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR) spectroscopy and Principal Component Analysis (PCA). In this study, we used 20 blue ballpoint pens from various Indian brands to prepare ink samples on three different substrates: 70 GSM office paper, 100 GSM office paper, and 180 GSM glossy photo sheet, resulting in a total of 60 samples. We acquired ATR-FTIR spectra using a Perkin Elmer Spectrum Two spectrometer in transmittance mode over the range of 4000 to 650 cm^{-1}. Each sample was scanned under consistent conditions, following proper surface cleaning and baseline correction. We normalized the resulting spectra and performed PCA using Python. Principal Component Analysis (PCA) was performed on the normalized ATR-FTIR spectra, and the first two components (PC1 and PC2) accounted for a cumulative variance of 92.2%, with PC1 contributing 8.4% and PC2 contributing 83.8%. The PCA score plot demonstrated clear clustering of ink samples based on the type of substrate used, indicating that substrate characteristics significantly influence spectral variability and enhance discrimination. This study confirms that the paper substrate greatly affects FTIR spectral results and the ink discrimination process. The combined ATR-FTIR and PCA method was effective for non-destructive differentiation of blue ballpoint pen inks and highlights the importance of considering substrate differences in forensic ink analysis.

Keywords: *Ballpoint pen ink, ATR-FTIR spectroscopy, PCA, paper substrate effect, forensic document examination, non-destructive analysis, ink discrimination*

A COMPREHENSIVE REVIEW OF DEEPFAKE AUDIO DETECTION: TECHNIQUES, APPLICATIONS, AND COUNTERMEASURES

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Abstract

Modern deepfake speech detection technologies have become very advanced, making it increasingly difficult to distinguish between genuine and synthetic audio signals. This paper sightsees the contemporary methods for generating deepfake audio detection methods, including mainly three approaches, especially text-to-speech synthesis, voice cloning, and advanced neural networks (ANN) which implement the Generative Adversarial Networks (GANs), WaveNet, and Tacotron. This paper insight into the different significances of deepfake speech in various fields, which highlights the potential applications and safekeeping risks at several levels, such as forged news propagation alongside identity theft, identity fraud, and voice phishing. The study evaluates the approaches that currently exist together with detection systems which feature, convolutional and recurrent neural networks (CNNs and RNNs), spectral analysis, and machine learning-based classifiers. There are many recent advancements in the field of deepfake detection which faces many challenges due to the increasingly sophisticated synthetic speech models. Forthcoming research must focus on improving the accuracy level of detection while developing real-time identification systems is also become an important task in the voice analysis field, and establishing the ethical guidelines to mitigate potential misuse of tools. This paper provides insights into the evolving landscape of deepfake speech detection, emphasizing the need for robust countermeasures and interdisciplinary collaboration.

Keywords: *Deepfake audio, Advanced Neural Network, Machine learning, Algorithms*

A COMPARATIVE STUDY BETWEEN DIFFERENT MACHINE LEARNING ALGORITHMS FOR SEX AND ETHNICITY ESTIMATION

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Abstract

Sex and stature estimation forms the most important aspects of building a biological profile of an unknown individual. These form the pillars of personal identification through anthropological examination of the skeletal remains. The skull, pelvis, long bones, teeth and mandible are some of the most commonly obtained evidences. These parts are resistant towards extreme weather conditions, decay and decomposition. Also, in cases of fragmented, charred or severely decomposed corpses, these can be imperative in the forensic analysis. However, modern anthropological studies involve a multitude of statistical tools to validate the results. Most anthropological studies are conducted either through metric or morphological methods using direct or imaging techniques. This study compares the usage of three machine learning algorithms namely, discriminant function analysis (DFA), principal component analysis (PCA) and receiver operating curve (ROC) analysis. The univariate DFA is extremely useful in studying the sexing accuracy of each craniometric or odontometric variable. However, the multivariate DFA allows to create a combination of variables to obtain the maximum classification accuracy. PCA on the other hand, allows for factory reduction. It helps to ascertain the variance of each variable and form principal components through it. The eigen values or correlation between each variable and the principal component can be used to differentiate between the two sexes. The ROC analysis is more of a validating tool for the results. This tool provides the Area under the curve (AUC) value of each variable. The optimum variables have an AUC of 1.00. This technique also provides cut-off points for each variable along with their sensitivity and 1-specificity values. These can help in assessing the performance of the variable in classifying the samples. All these machine learning algorithms

are based on supervised and unsupervised learning modes. However, their usage may reveal different results for different populations, age groups and ethnicities. Thus, it is necessary to conduct regional studies and update such databases on a regular basis.

Keywords: *sex estimation, forensics, anthropology, machine learning, personal identification*

ANALYZING REGIONAL PATTERNS AND TEMPORAL TRENDS OF CYBERCRIME IN INDIA (2016–2022) WITH PREDICTIVE FORECASTING USING NCRB DATA

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Abstract

Cybercrime in India has surged significantly alongside the country's rapid digital transformation, impacting individuals, businesses, and government sectors. The widespread adoption of the internet, digital payment systems, and online platforms has increased susceptibility to a diverse range of cyber threats. At the same time, data analytics have improved the detection, classification, and prediction of cybercriminal activities, providing valuable tools for combating these threats. In view to this, the present study utilizes data from the National Crime Records Bureau (NCRB) spanning 2016 to 2022, disaggregated by states and Union Territories, to analyze and forecast cybercrime trends. The dataset includes offenses recorded under the Information Technology Act, Indian Penal Code, Special and Local Laws, and crimes specifically targeting women. The analysis identifies regional hotspots for various cybercrimes in India. Gujarat and Maharashtra lead in abetment to commit cybercrime, while Karnataka and Uttar Pradesh report high cases of offenses like cheating by personation, computer-related crimes, and identity theft. Assam and UP show notable cyberterrorism incidents. Maharashtra and Telangana exhibit rising cyber fraud, whereas the North-East and Eastern regions record the lowest cybercrime rates. Southern India shows a significant upward trend in IT Act cybercrimes and cybercrimes against women, with ARIMA models forecasting continued increases, especially in the South and Central regions. Statistically, cybercrime saw a sharp rise from 2016 to 2019 (APC ~56.5%) and continued growing at a slower pace thereafter. IPC-related offenses grew significantly by 43.5% annually (2016–2022), while SLL crimes remained stable. Sexual offenses surged until 2020, then plateaued. Privacy violations and identity theft increased sharply before declining post-2019. Various other cybercrime categories showed fluctuating or sign-reversed trends, highlighting evolving patterns. Overall,

the data emphasizes the urgent need for region-specific law enforcement and policy interventions to address this dynamic threat landscape.

Keywords: *NCRB Data Analysis, Cybercrime Trends 2016–2019, Online Fraud Trends, Crime Data Analytics, Average Percent Change (APC)*

NEED OF FOOD FORENSICS IN INDIAN CONTEXT: A REVIEW

Abstract

Food contamination and adulteration like pesticide contamination, adulterated food oil, dairy products, spice and honey adulteration are very common in India which create serious public health risks and economic stability. FSSAI (Food Safety and Standards Authority of India) being a regulatory and administrative body, the role of Forensic Science Laboratories (FSLs) as legal and investigative bodies becomes essential to analyse, ensure and provide expert testimony. While quality assurance is the main goal of traditional food testing methods, lack the forensic diligence need to hold people accountable in cases of intentional adulteration, food fraud, or crimes involving food. This imbalance highlights the increasing demand for food forensics as a specialist area of forensic science laboratories (FSLs) in India. Advanced analytical techniques like DNA barcoding for species identification, GC-MS and LC-MS/MS for chemical adulterants, ICP-MS for heavy metals, and microbiological assays for pathogen detection are all integrated with forensic protocols of evidence preservation, chain of custody, and legal admissibility in food forensics, also addressing new issues like food terrorism and bio-crimes. The establishment of food forensic unit in FSLs will help to fill the gap between the criminal justice system, public health, and analytical toxicology. This will protect consumer rights and guarantee that those who commit food fraud are held legally responsible. Thus, food forensics represents a crucial step toward protecting public health and ensuring justice in India.

Keywords: *Food forensics, Adulteration, Forensic science laboratories, India, Food fraud, public health*

SILENT KILLERS AT HOME: TOXICOLOGICAL AND MEDICO-LEGAL PERSPECTIVES ON READILY AVAILABLE SUBSTANCES

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Abstract

Household environments often harbor toxic hazards in the form of readily available products such as cleaning agents, over-the-counter (OTC) medications, alcohol substitutes, pesticides, and even common culinary items like salt. Although these substances are perceived as harmless or mundane, their toxic potential is frequently underestimated, earning them the designation of "silent killers at home." Poisonings involving these agents have been reported globally and span the spectrum of accidental, suicidal, and even homicidal contexts. From a toxicological perspective, these agents exert harm through diverse mechanisms including corrosive injury to the gastrointestinal tract, hepatic and renal failure, electrolyte and metabolic disturbances, central nervous system depression, and sudden cardiovascular collapse. The clinical outcomes are equally varied, ranging from reversible organ dysfunction to fatal multi-organ failure.The medico-legal dimensions of such poisonings present significant challenges. Establishing the precise cause and manner of death often requires meticulous toxicological analysis and correlation with circumstantial evidence, especially in settings where intentional ingestion must be distinguished from accidental exposure. Further complexity arises in the regulation and labeling of such household substances, with gaps in consumer safety standards and lack of public awareness often contributing to misuse. Case reports in the literature illustrate not only the medical emergencies precipitated by these exposures but also the broader societal and legal implications, including issues of accessibility, regulatory oversight, and the burden on healthcare systems.This review synthesizes current knowledge on the toxic profiles of commonly implicated household agents, the forensic strategies employed in their investigation, and the public health dimensions of prevention. It underscores the pressing need for enhanced regulatory frameworks, improved packaging and warning labels, and widespread community

education to mitigate the morbidity and mortality linked to these silent yet pervasive household toxicants.

Keywords: *Household poisoning; Silent killers; Medico-legal implications; Toxicology; Corrosive ingestion*

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