APA MAGAZINE

THE MAGAZINE FOR THE POLYGRAPH PROFESSIONAL

MAY • JUN Vol. 55.3

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Our Goal is to provide the legal profession and law enforcement agencies with ethical and skilled practitioners. Our Objective is to provide students with the education and training necessary to:

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- Conduct effective pre-employment screening polygraph examinations for government agencies.
- Conduct effective investigative polygraph examinations for law enforcement agencies.

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DEADLINES

Deadline for July/August issue: July 31, 2022

The APA Magazine is published by the American Polygraph Association. The information, content, and opinions provided and expressed in this magazine are those of the authors, and do not necessarily reflect the opinion or policy of the APA or its leadership. To the extent such information, content and opinions address legal issues they are not intended to constitute legal advice. Rather, all information, content, and opinions provided and expressed in this magazine are for general informational purposes only. References in this magazine to any specific commercial pro-ducts, process, or service by trade name, trademark, manufacturer or otherwise, does not necessarily constitute or imply endorsement, recommendation, or favoring by the APA or its leadership.

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Advertising and Editorial address is
editor@polygraph.org
Subscription address is: APA, P.O. Box 8037, Chattanooga, TN 37414- 0037.

The APA Magazine is published six times per year and is available in electronic format only. Address and e-mail changes/updates should be sent to: APA, P.O. Box 8037,
Chattanooga, TN 37414-0037,
or manager@apapolygraph.org
E-mail notification is sent to subscribers when the latest publication is available.

The APA webmaster is not responsible for issues not received because of improper address information. Submission of polygraph related articles should be sent to:
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From Texas to Ukraine

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56th Annual Seminar

August 28 - September 2

2022

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SCHEDULE Sunday, August 28, 2022

CLASSROOM A

1:00 p.m. - 3:00 p.m

The Importance of the Pretest Interview for Post Test Interrogations

Roy Ortiz

APA PRESIDENT

1:00 p.m. - 3:00 p.m

SCHOOL DIRECTOR'S MEETING

Room TBD

3:00 p.m - 5:00 p.m

"What's That?!" - Identifying and Interacting with Unusual Populations in Polygraph

Erika Thiel

APA DIRECTOR

6:30 p.m. - 8:30 p.m

APA WELCOME RECEPTION

SCHEDULE Monday, August 29, 2022

CLASSROOM A

7:30 a.m. - 8:00 a.m Break Sponsored by:

8:00 a.m - 9:00 p.m Opening Ceremonies

Call to Order	Roy Ortiz, APA PRESIDENT
Presentation of Colors Guard	Orlando Police Department Honor Guard
Pipe and Drum Corp	TBD
The National Anthem	Gladys Justiniano, Orlando Police Department
Pledge of Allegiance	Barry Cushman, APA EAC MANAGER
Invocation	Barry Cushman, APA EAC MANAGER
In Memorium	Barry Cushman, APA EAC MANAGER
Taps	Ray Nelson, APA DIRECTOR
Welcome to Orlando	Deputy Chief Eric Smith, ORLANDO POLICE DEPARTMENT
President's Message	Roy Ortiz, APA PRESIDENT
Seminar Program Chair	Pam Shaw, APA SEMINAR PROGRAM CHAIR
APA Awards for 2022	Lisa Ribacoff, APA DIRECTOR

9:00 a.m. - 9:15 a.m Break Sponsored by:

9:00 a.m - 12:00 noon

Case Review: Garda Armored Car Heist, Methuen, Massachusetts

Mike Delapena
RETIRED FBI

12:00 noon - 1:00 pm Lunch on your own

1:00 p.m. - 5:00 p.m.

Identifying and Energizing the Cognitive Cues of Deception: An Effective 3 Prong Approach

Stan B. Walters
TRUTH & DECEPTION, INC

2:45 - 3:00 pm Break Sponsored by:

(Con't)

Identifying and Energizing the Cognitive Cues of Deception: An Effective 3 Prong Approach

SCHEDULE Tuesday, August 30, 2022

CLASSROOM A	CLASSROOM B	CLASSROOM C
7:30 a.m. - 8:00 a.m Break Sponsored by:		
8:00 p.m - 10:00 p.m **Test Data Analysis** Steve Pilkington C3A	8:00 p.m - 10:00 p.m **Polygraph Legal Update for Law Enforcement & Government** Gordon Vaughan APA LEGAL COUNSEL	8:00 p.m - 10:00 p.m **Interviewing Victims/Witnesses & Normal Memory Loss** Chip Morgan APA DIRECTOR
9:45 - 10:00 am Break Sponsored By:		
6:30 p.m. - 8:30 p.m **APA Annual Business Meeting** CLASSROOM A		
12:00 noon - 1:00 p.m. Lunch On Your Own		
1:00 p.m - 5:00 p.m **Quit Being So Inconclusive!** Brad Beeler USSS SPECIAL AGENT / NCCA INSTRUCTOR	1:00 p.m - 5:00 p.m **Personality & Polygraph** Maria Soupley 3S SECURITY SOLUTIONS, INC.	1:00 p.m - 3:00 p.m **Effect of EDA Self-Centering Mode on Scores and Decisions** Don Krapohl APA PRESIDENT- ELECT
2:45 - 3:00 pm Break Sponsored By:		
(Con't) **Quit Being So Inconclusive!**	(Con't) **Personality & Polygraph**	3:00 p.m - 5:00 p.m **EDA Filters & Technology** Instrument Manufacturers

SCHEDULE Wednesday, August 31, 2022

CLASSROOM A

7:30 a.m. - 8:00 a.m Break Sponsored by:

8:00 a.m - 12:00 noon

Part One: The Essential Elements of the Reid Technique

Joseph Buckley

JOHN E. REID & ASSOCIATES

(Con't)

Part Two: False Confessions – The Issues to be Considered

9:45 a.m. - 10:00 am Break Sponsored By:

1:00 p.m. - 3:00 p.m.

Countermeasures

CLASSROOM B

8:00 a.m - 12:00 noon

Indicators of Deception

Dr. Kevin Colwell

SOUTHERN STATE CONNECTICUT UNIVERSITY

(Con't)

Indicators of Deception

12:00 Noon - 1:00 p.m. Lunch On Your Own

1:00 a.m. - 5:00 pm

Generational Interviewing

Chris Campbell

NORTH CAROLINA STATE BUREAU OF INVESTIGATION

CLASSROOM C

8:00 a.m - 9:00 a.m

Information Protection & Cyber Security: Best Practices for Polygraph Examiners Loss

Dr. Joseph Stainback

APPLIED INVESTIGATIONS

9:00 a.m - 10:00 a.m

Dealing with Legal CBD Products in Polygraph

Dr. Joseph Stainback

APPLIED INVESTIGATIONS

10:00 a.m - 12:00 noon

Tactical Polygraph

Brad Beeler

USSS SPECIAL AGENT / NCCA INSTRUCTOR

1:00 a.m. - 5:00 pm

A 5-Year Research on the Impact of Trauma - How Not to Interpret Trauma as Deception

Pascal Labine

OTTAWA POLICE SERVICE

SCHEDULE Wednesday, August 31, 2022

CLASSROOM A	CLASSROOM B	CLASSROOM C
2:45 - 3:00 p.m. Break Sponsored By:		
3:00 p.m. - 5:00 p.m.	(Con't)	(Con't)
Teen Polys: Tips, Trips, and Tricks Jared Lockwood, LCSW INTERMOUNTAIN POLYGRAPH SERVICES	**Generational Interviewing**	**A 5-Year Research on the Impact of Trauma - How Not to Interpret Trauma as Deception**

SCHEDULE Thursday, September 1, 2022

CLASSROOM A	CLASSROOM B	CLASSROOM C
7:30 a.m. - 8:00 a.m. Break Sponsored By:		
8:00 a.m. - 12:00 noon **The Evolution of the Investigative Interview** Dave Thompson Wicklander Zulawski	8:00 a.m. - 10:00 a.m. **A Historical Polygraph Case** Don Krapohl APA PRESIDENT-ELECT	8:00 a.m. - 10:00 a.m. **Polygraph Legal Update for Private Examiners** Gordon Vaughan APA GENERAL COUNSEL
9:45 a.m. - 10:00 a.m. Break Sponsored By:		
(Con't) **The Evolution of the Investigative Interview**	10:00 a.m. - 12:00 noon **Scoring, Not Ignoring** Skip Webb APA PAST - PRESIDENT	10:00 a.m. - 11:00 a.m. **Virtual Reality and Credibility Assessment** Dr. Joyce Sam TEMASEK LABORATORIES AT NTU 11:00 a.m. - 12:00 a.m. **Melding of Credibility Assessment & AI** Aaron Burciaga DATAPRIME
12:00 noon - 1:00 p.m. Lunch On Your Own		
1:00 p.m - 3:00 p.m. **The Psychology of Lying** Maria Soupley 3S SECURITY SOLUTIONS, INC.	1:00 p.m - 3:00 p.m. **Polygraph Salaries for Law Enforcement Within the U.S.** Sam Sneed KANSAS CITY POLICE DEPARTMENT	1:00 p.m - 3:00 p.m. **Assessment of Jihadists in Indonesia - Perspectives from Ground Zero & Beyond** Mirra Noor Milla UNIVERSITAS INDONESIA Joseph Bradley RETIRED FBI Low Tee Meng NANYANG TECHNOLOGY UNIVERSITY

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CLASSROOM A	CLASSROOM B	CLASSROOM C
2:45 p.m. - 3:00 pm Break Sponsored By:		
3:00 p.m - 5:00 p.m. **Setting Comparisons** Chad Russell APA TREASURER	3:00 p.m - 5:00 p.m. **Female & Transgender Offenders** Alisha Argo, NCC, LPC THE CONNECTION INC.	3:00 p.m - 5:00 p.m. **Investigative/ Linguistic Statement Analysis - S.U.R.G.E.** Mike Woodrow UNION BEACH POLICE DEPARTMENT

APA ANNUAL BANQUET AND AWARDS

6:00 p.m. - 6:30 p.m. Cocktails

6:30 p.m. Dinner

56th Annual Seminar

Signia by Hilton
Orlando Bonnet Creek

SCHEDULE Friday, September 2, 2022

CLASSROOM A

7:30 a.m. - 8:00 a.m. Break Sponsored By:

8:00 a.m. - 10:00 a.m.

Revisiting Salience and "Psychological Set"
Michael Gougler, APA DIRECTOR
Mark Handler, APA EDITOR

9:45 a.m. - 10:00 a.m. Break Sponsored By:

10:00 a.m. - 12:00 noon

Motivational Interviewing
Alisha Argo, NCC, LPC
THE CONNECTION INC.

12:00 noop - 1:00 p.m. Lunch On Your Own

1:00 p.m. - 3:00 p.m.

Polygraph and the Media
Lisa Ribacoff
APA DIRECTOR

3:00 p.m.

Closing Remarks
Donald Krapohl
APA PRESIDENT-ELECT

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President´s Message

Roy Ortiz

APA ELECTIONS 2022

By the time that you receive this “magazine”, the APA elections will be over. I want to extend my sincerest thanks and gratitude to everyone who voted and to those who ran for office. Please remember that you do not have to hold office to have your “ideas”, become reality. Your suggestions should be forwarded to anyone on the Board of Directors.

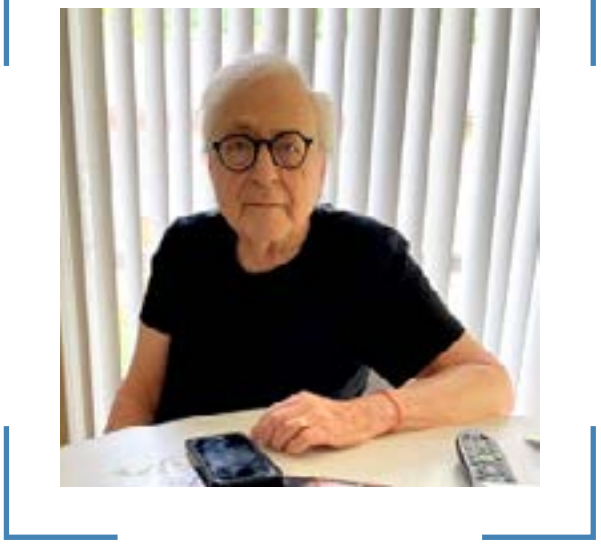
As always please submit your polygraph “success stories” for publication. State polygraph associations and national associations are encouraged to keep us updated on any major changes and training opportunities.

ANNUAL SEMINAR 2022

Pam Shaw has been working tirelessly on this year's seminar. I will not be revealing any details, but I know that there will be several new "activities" introduced. I am sure that Pam will be sharing these new activities in the future. I not only consider the seminar as our annual training, but a family reunion. Due to world-wide challenges in the past three years, many members have been unable to attend a seminar. It will be great to visit with old friends and an opportunity to make new ones.

TIME FLIES

A short review of Larry Wasser's polygraph career



Former three term president of the Michigan Association of Polygraph Examiners

Twelve-year member of the Michigan State Board of Forensic Polygraph Examiners

Fifty-year member of the APA (1972-2022)

Former APA Vice President

Former APA Treasurer

1995 Al and Dorothea Clinchard Award recipient

1996 J.J. Heger Award recipient

1999 Leonarde Keeler Award recipient

2003 William L. and Robbie S. Bennett Memorial Award recipient

2007 APA President's Award recipient

I would like to thank Larry for his contributions to the polygraph profession.

FAMILY FIRST….

Board of Directors' Reports

Sabino Martinez
Chairman

Greetings to all!
I hope that this magazine finds all of you in good spirits and in good health. I hope that those of you that are going to be with us in Orlando for our annual seminar are registered and ready. I know that flying these days has become a challenge and I commend all of you who will take-on the task of being with us. As I write this submission to the magazine, I can't help but ask for your prayers for our neighbors in Uvalde, Texas who lost their loved ones in a senseless and tragic act of violence. Your participation in the elections is greatly appreciated and I hope that you take the time to always represent yourself as a member. We also appreciate all the submissions for awards this year and we will soon be selecting those members who go above and beyond and deserve recognition. See you all in Orlando Thank you all and please be careful!

Pam Shaw
Seminar Program Chair

I am getting excited for the upcoming seminar in Orlando! We have a great lineup of speakers and topics for you to benefit from during the week, along with various fresh additions to the seminar planning to enhance the experience. A recently updated seminar schedule has been posted on the APA website, as well as published in this issue of the magazine. I am encouraged to see many new speakers and a variety of interesting topics that will hopefully keep you engaged all throughout the week.

As with any big event, there have been many hardworking board members and committee members working behind the scenes to ensure this year's seminar is set up for success! Given that there are so many wonderful attractions in the Orlando area, we initially weren't looking to put on a Tuesday night event, but, a special opportunity came our way and we are now excited to offer our members the chance to see Cirque du Soleil's Drawn to Life event at Disney Springs at a significantly reduced cost. Tickets purchased directly from Cirque de Soleil's website would cost approximately $115 each (inclusive of taxes and fees), but we are happy to offer the tickets at a flat-rate, reduced cost of $70 each. There are a limited number of tickets, and as you would expect, tickets will be sold on a first come, first serve basis. We encourage you to purchase/secure your tickets in advance directly via the APA's website or by contacting the APA National Office. Also, please note that our host hotel, the Signia by Hilton Orlando Bonnet Creek, provides shuttle bus services to and from Disney Springs at regularly scheduled times throughout the day and evening hours which makes attending the event even more of a breeze.

To further enhance your seminar experience, we will be offering the opportunity to participate in an agency patch exchange, more commonly known as a patch wall.

It's simple how it works….just bring a patch or two from your agency and exchange it for a patch or two from another agency. We're also excited to incorporate a couple of photo booth opportunities throughout the week at two of our most favored events – the Sunday evening Welcome Reception and our Thursday night banquet, so you can have special and/or fun photos to take with you from the seminar to accompany those awesome memories! Another exciting addition to the seminar this year is the return of door prizes for our collective group events and sessions. Who doesn't love a door prize?! Again, as you would expect – you must be present to win, so I sure hope you're planning to be with us throughout the entire week!

There are other hopeful events and announcements coming related to the seminar, but you'll have to watch out for emails, Facebook announcements and/or other means of communication in the coming months to catch the latest and greatest news. In the meanwhile, please be sure to send in your registrations and payments early so you can have a smooth sign-in at the registration desk on Sunday afternoon. And, of course, if you haven't done so already, please be sure to secure your hotel reservations at the Signia by Hilton so you can be sure to be onsite with us throughout the time of the seminar, while also being able to take advantage of the various offered amenities.

I look forward to seeing you in Orlando!

All the best,

Pam Shaw
Seminar Program Chair

Donnie Dutton
Director

Greetings fellow APA Members,
I hope that everyone is doing well and that you are starting to get excited about our upcoming annual seminar to be held in Orlando, Florida, at the hotel resort Signia by Hilton Bonnet Creek. At our winter board meeting we got a tour of the facility and as always it is a first-class facility to say the least. The property is well-maintained and the lazy river looks to be very inviting. The area where we are having our Sunday night get-together is going to be an event all on its own. We will be in this huge tent structure with an outdoor area behind. As I understand it Pam Shaw has some ideas for a theme and am looking forward to learning more about that very soon.

In this magazine I decided to write an article on a little bit of history concerning the Zone Comparison Test and the use of the SKY and Guilt Complex Reactor that we used in the Federal Government until sometime around the mid to late 80's. I hope you enjoy it and let me know if you would like to see more of this type article.

By the time you read this the deadline will be very close if not closed for nominations for our annual awards so if you have a deserving person for an award, please visit www.polygraph.org; and under the membership tab look for "APA awards and nominations" and submit. If you need any assistance on how to complete the form just let me know. While on the topic of submissions, please if you know anyone who wants to become an examiner, have them complete the process for the William J. Yankee scholarship award.

This award can also be found under www.polygraph.org; and this application is located under the training tab.

I received a few comments on the article I wrote in the last magazine. I am truly glad that it helped some of you understand why doing research is so darn hard. Since we are not doing any research presently, I thought I would report on a piece of research that I found which Dr. Sheila Reed did while employed at the Department of Defense Polygraph Institute. I have taken the liberty of paraphrasing her findings.

Project
This research was conducted at the Department of Defense Polygraph Institute (DoDPI) back in 1993 by Dr. Sheila Reed. The title of the project was: "Subculture Report: Effects of Examiner's and Examinee's Race on Psychophysiological Detection of Deception Outcome Accuracy." The project was carried out at DoDPI when it was still located at Ft. Jackson, Alabama, under (DoDPI91-P-0013). This project was looking to see if race had any impact on the test outcome and it examined three factors:

1. Assessment of the effect of the race of the examinee on the accuracies of the examination

2. Effect of the race of the examiner on the accuracies of the examination

3. Interaction of the race of the examinee and the race of the examiner on the accuracies of the examination

This study used a total of 13 examiners, three Black, three Hispanic and seven Caucasian. The examiners were students attending their initial training from DoDPI and were in weeks 7 and 8 when they collected data using the Zone Comparison Test (ZCT). Then during weeks 10 and 11 again the students and some DoDPI instructors conducted charts using the Modified General Question Technique (MGQT). A total of 375 subjects participated in this study: 62 Hispanic, 95 Black and 218 Caucasian. The guilty subjects were involved in one of several different mock crimes: Murder, Rape, Sexual Assault, theft etc. All scoring was done using a 7-position scale of +/-3.

Results
In regard to race, neither the race of the examinee or the race of the examiner or any interactions between them resulted in statistically significant differences. Looking at this study it appears that the race of the examinee, race of the examiner or any interactions between the two makes any difference in accuracy of decisions.

Lastly, my thoughts and prayers are with all of you in Ukraine and I pray that this nightmare will end soon for your country.

Mike Gougler
Director

Fellow members,
I hope everyone is doing well. I am looking forward to seeing you in Orlando in August at the annual seminar.

There were two motions made at the mid-year meeting related to associate membership. The first included creating a

new class of membership and creating a pathway to Member status for associate members without a college degree. This motion was defeated. The second motion was to allow Associate members to run for elected office and be able to hold any appointed position including lead any APA committee. This motion was also defeated. This motion, however, was referred for discussion to be looked at further. This motion will be reintroduced at the board meeting before the start of the annual seminar. I am hopeful that the Board will pass this motion. This motion, if approved, will allow the membership to vote on and decide whether associate members will be allowed to run for elected office and hold any appointed position in the APA. I believe that we should allow the members to have a voice in deciding the fate of this important issue.

Please feel free to contact me if I can help you in any way.

Respectfully submitted, Mike

Jamie McCloughan
Director

I hope everyone is enjoying the warmup and nicer weather. I have a quick update for you on the Education Accreditation Committee (EAC).

The Education Accreditation Committee is in full swing and has many inspections coming up, including some of the newly proposed education and training programs. New programs are required to have an onsite inspection to be accredited. Once a program has passed its initial onsite inspection, it can be inspected virtually. The virtual inspections require access to all the documentation that is traditionally reviewed by an inspector at the location. Programs provide the required material in many forms and often use virtual video to allow inspection of the facility. Some of the benefits are there is little to no disruption of courses that are currently in session, and the cost for some is much less, as there are no transportation, lodging, and meal charges that are normally incurred with an inspector being physically present. This type of inspection is favored by some, but others would rather have the traditional inspection, which is still an option if preferred. Traditionally, a few students are interviewed about their education and training when they are in about the eighth week. Although this isn't required, many programs and inspectors find it beneficial. Virtual inspections require organizing all of the required documentation and often take longer than an onsite inspection. Regardless of the method, I can ensure you the process is thorough. The number one goal of the APA is to ensure students get the minimum required education and training prescribed in the accreditation manual.

If you have any questions or suggestions on anything else APA or polygraph-related, please feel free to contact me at my email address or call me at 989-745-1912. May those fighting for our freedom against threats, both foreign and domestic, be safe and have Godspeed in their return to friends and loved ones.

Chip Morgan
Director

Voting is Upon Us!
As I write this, we are just about to begin

voting for APA officers. I'd like to thank you all for volunteering to run for office, for writing campaign positions and for voting. This organization is only as good as its members and I think we have fine members indeed!

Since my last Director's report, the world has continued to be wracked in violence, from the Russia/Ukraine conflict to the recent shootings in Uvalde, Texas. My thoughts and prayers go out to the victims worldwide of senseless violence.

As the committee chair of the Ethics and Grievance Committee, I have observed that complaints against members have remained infrequent, a testament to our professionalism. For an organization as large as ours, spread worldwide, we receive relatively few complaints. The committee attempts to rectify all complaints and we try our best to investigate some tricky situations. To that end, we have proposed some changes to the Standards of Practice for the Board and membership consideration. If those changes are adopted, I will talk more about them in my next Director's report.

I look forward to seeing everyone at the upcoming seminar in Orlando, Florida. If you see me there, please stop and say Hi, it's good to maintain friendships in this profession.

See you in Orlando!
Chip

DirectorMorgan@polygraph.org
lieguy@gmail.com

Erika Thiel
Director

Hello everyone! As many of you know, there has been some big changes in my life recently with the arrival of our daughter in early May. With that being said, there is not too much to report in regard to the PCSOT Committee. There has been no applications for new instructors or programs since the last magazine. The Committee has begun discussing how to create and publish information to the APA website. This is still in the beginning phases, but there has been a lot of great discussion from the PCSOT committee about what this could look like. If there is any information in the model policy that does not seem clear, the committee would appreciate knowing this. This information will allow us to create more elaborated information to publish to the website that expands upon the model policy without replacing information that should be learned in a 40 hour basic PCSOT course or a refresher course. You can email your thoughts at directorthiel@gmail.com. Otherwise, please ensure to continue to take care of yourselves. There are special thoughts and prayers going out to our Ukrainian friends and their battle for their livelihood and continued independence.

	2022	2023	2024
Basic *400 Hour*	May 2 - July 8 September 6 - November 11	January 9 - March 17 May 1 - July 7 September 5 - November 10	January 8 - March 15 May 6 - July 12 September 3 - November 8
Advanced *40 Hour*	March 28 - April 1 July 18 - 22 December 5 - 9 *(in Lafayette, IN)*	March 27 - 31 July 17 - 21 December 4 - 8 *(in Lafayette, IN)*	March 25 - 29 July 22 - 26 December 2 - 6 *(in Lafayette, IN)*
PCSOT *40 Hour*	March 21 - 25 July 11 - 15	March 20 - 24 July 10 - 14	March 18 - 22 July 15 - 19

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Utah COT 3 RQs Course: 8 Hour
How to Use the Directed Lie Screening Test (DLST): 8 Hour
How to Use the Acquaintance Test: 8 Hour
Plethysmograph: How and Why: 8 Hour

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Chart Scoring Practice

Kristine Smith[1]
Donald J. Krapohl[2]

We are what we repeatedly do. Excellence therefore is not an act, but a habit

– Aristotle

Greetings from Canada! I am thankful for the amazing opportunity to produce this column. To follow up on Don Krapohl's introduction from the previous issue, I am currently employed with a large team of examiners who principally conduct screening examinations (though we also administer a number of diagnostic examinations). I have been a polygraph examiner for 12 years, and a polygraph manager for 4 years. Though my managerial duties reduce my polygraph production, I still conduct examinations on a regular basis, not only to maintain my practice, but also to stay attuned to the realities and challenges of administering polygraph examinations.

Throughout my time in polygraph, I have experienced the many benefits of working with several examiners in one building. I understand that this is not the reality for most examiners. Scoring charts and rendering opinions can feel daunting for examiners. I hope that I can be of assistance through these exercises. Thanks in advance for your patience as I adjust to writing this column. If you would like to see specific types of charts, or have other suggestions, please send your comments to kristine.polygraph@gmail.com. Of course, Don remains available as well at APAKrapohl@gmail.com.

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[1] Director, Canadian Centre for Credibility Assessment (CCCA). Questions, comments and suggestions can be directed to the author at kristine.polygraph@gmail.com.
[2]Director, Educational Services, Capital Center for Credibility Assessment (C³A).

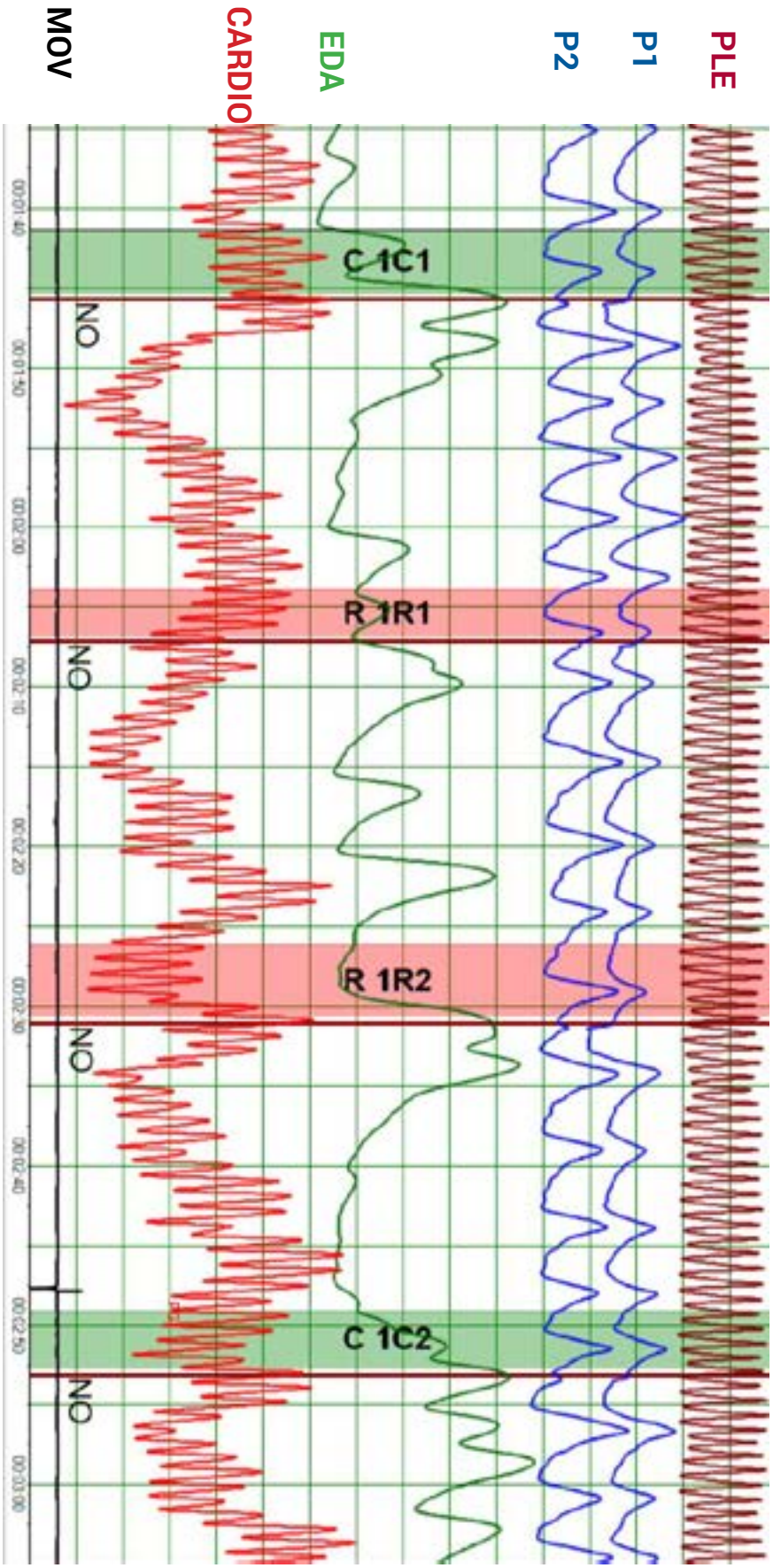
Now for chart scoring. I will offer a variety of formats for chart scoring in the coming months, produced by both Lafayette and Limestone polygraph systems. Some charts will be straightforward, while others will have some distortions, or other features of interest. On this first occasion, I have selected a DLST performed using a Limestone Paragon system. For examiners unfamiliar with the DLST, the DLST is a mixed-issue screening test, with two relevant questions, and two directed lie comparison questions. It is a one chart examination where the two relevant questions are asked three times (bracketed by two comparison questions). Relevant questions are scored against the comparison questions immediately bracketed to the left and right of the relevant questions.

Standardization is key with a large team of examiners like mine; for this reason, the PLE measurement (pulse amplitude) and the Respiration Line Excursion (RLE) measurement tools are used to score the photoplethysmograph and respiration channels (unless the data is distorted). For the purposes of these chart scoring exercises, I will provide both computerized and visual (pattern recognition) scores for respiration. The EDA is displayed in the manual mode, and the 10% differential threshold was used to assign the +/- scores. Charts are evaluated using the ESS.The question spacing is about 20 seconds due to the length of the DLST (for other formats I ask for a 25-second interval).

For convenience of scorers the charts scorers can evaluate the data trends and overall chart quality. The following three images are enlarged versions of the chart segments you should use for assigning scores. The school solution for this exercise is found on page 137. Note that the vertical lines mark the yes/no answer. The triangles on the compressed view chart mark the end of the response onset window (ROW), according to the software (five seconds after yes/no answer).

The APA Magazine is published in PDF format. To change the size of the charts you can click on the symbols -/+ at the top of the Adobe screen, or at the menu bar click on View > Zoom > Zoom To and then choose the level of magnification you prefer. To rotate the charts, click on View > Rotate View and then choose either clockwise or counterclockwise.

Good luck.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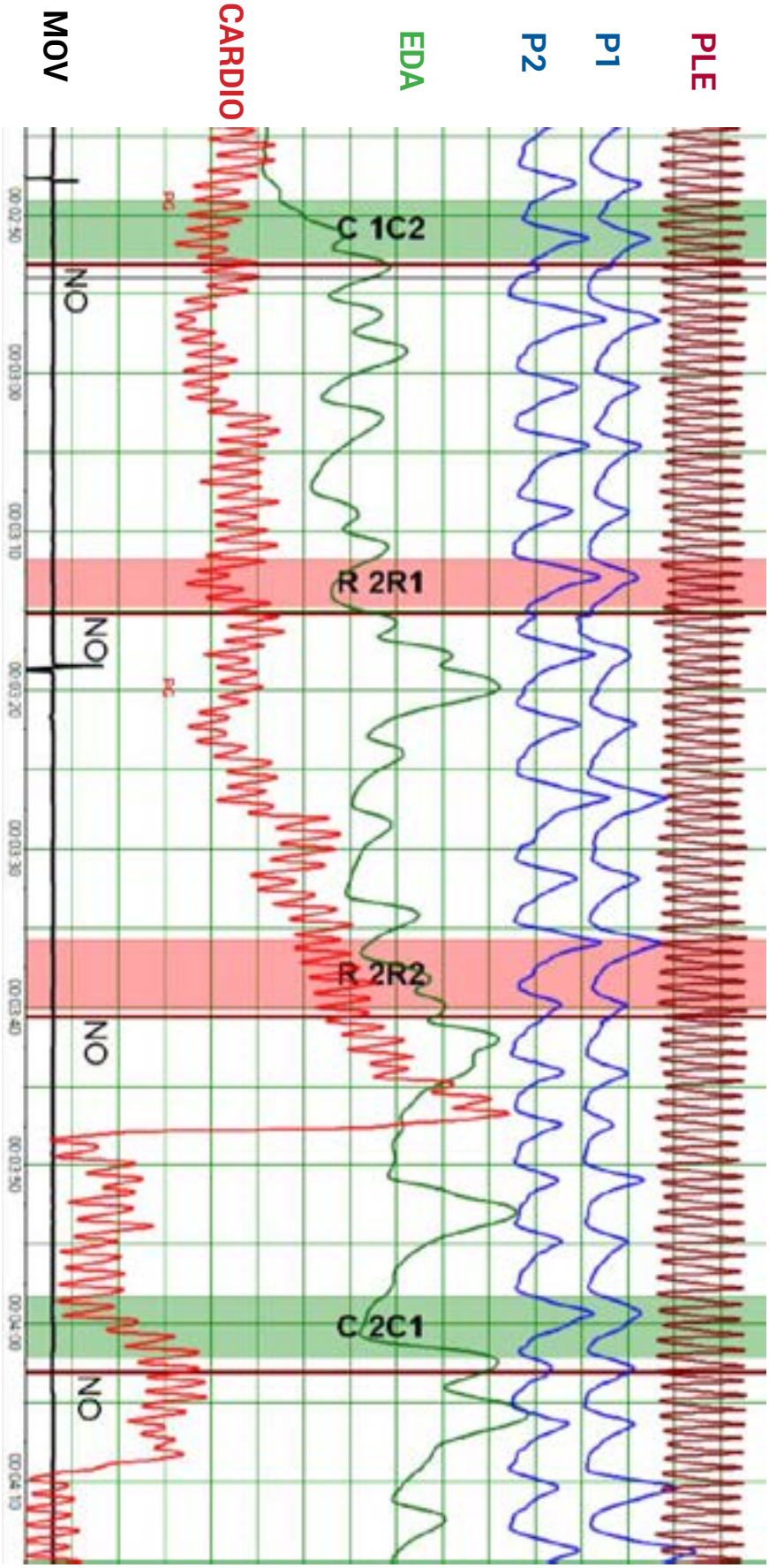
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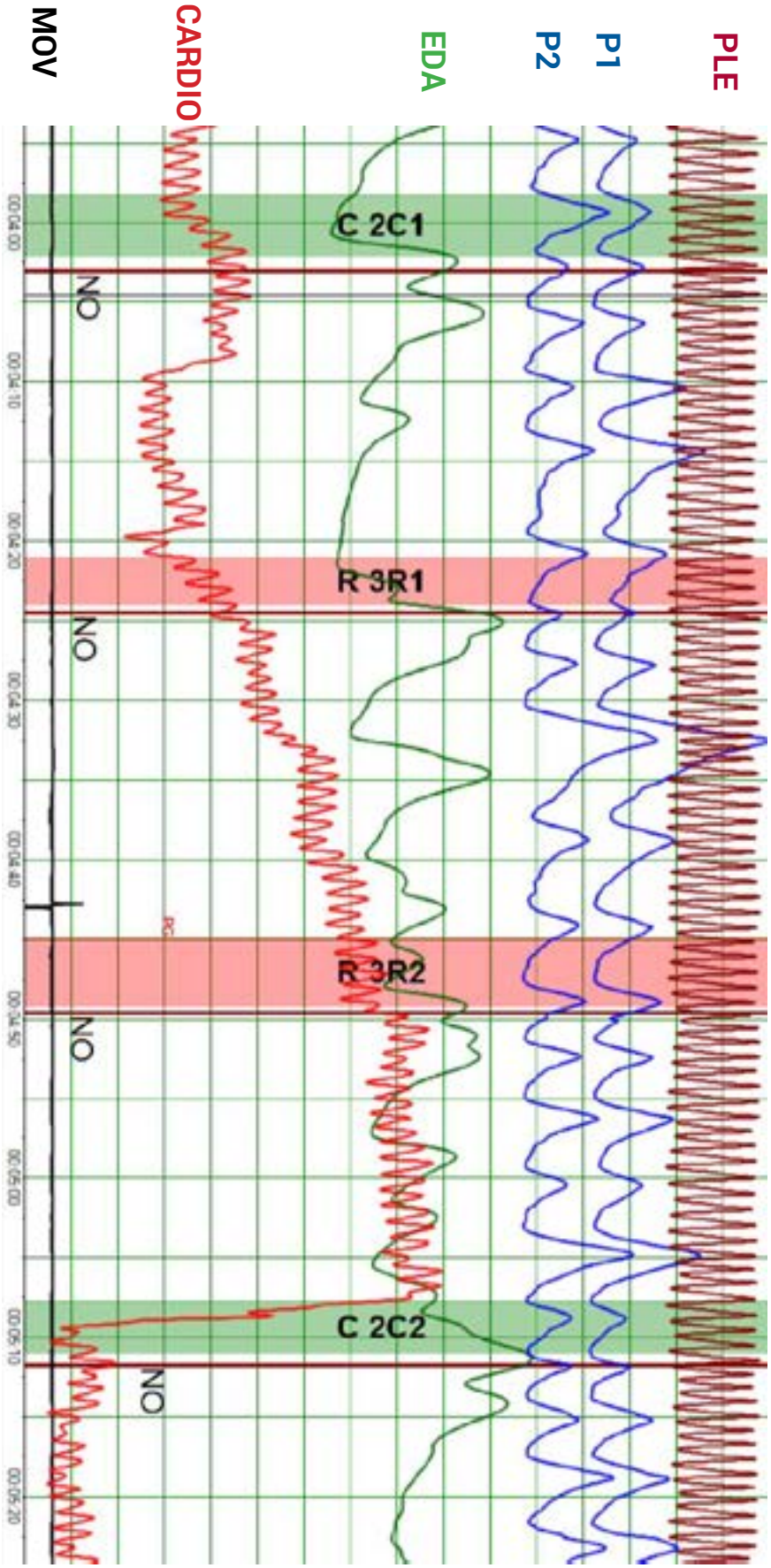
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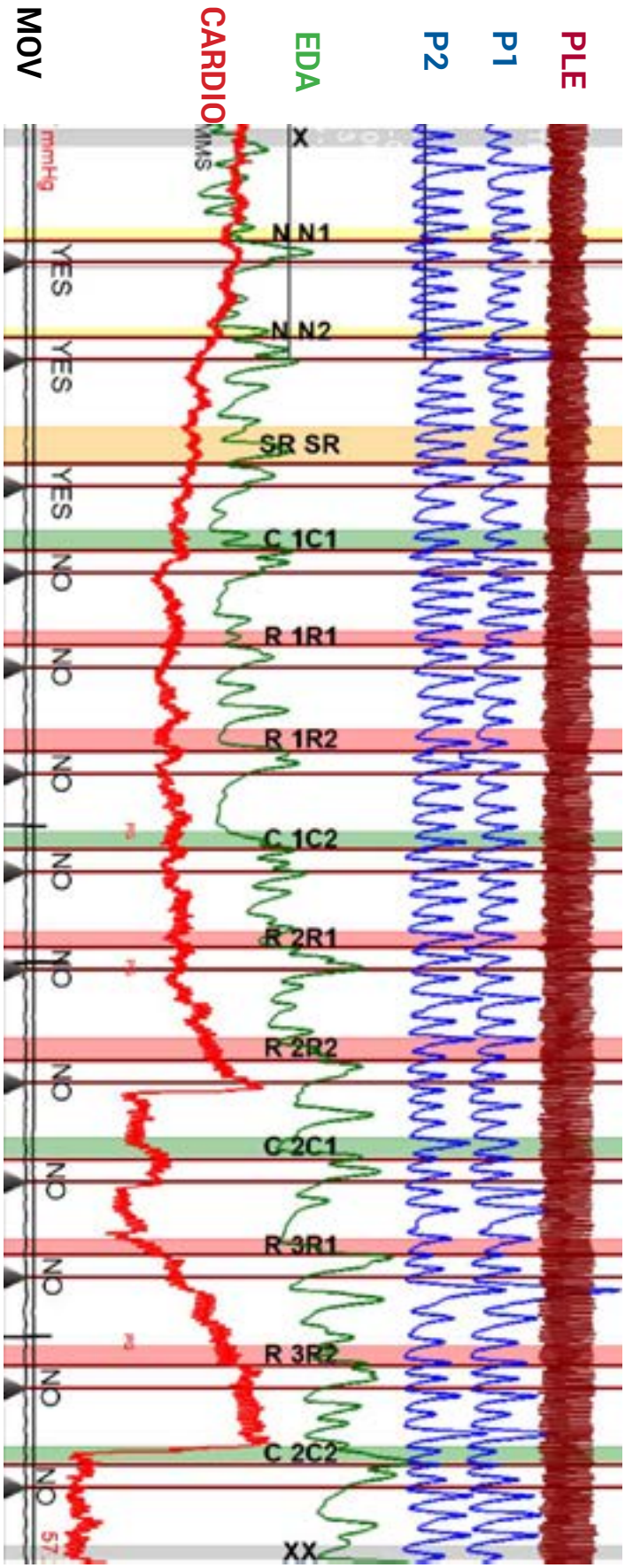
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Five Minute Science Lesson: Significant Figures (Why are odds expressed using whole numbers? And what does this have to do with polygraph test results?)

Raymond Nelson

Scientific tests are intended to quantify any phenomena that cannot be subject to direct physical measurement. To accomplish this, scientific tests rely on proxy information that is correlated with the phenomena of interest, along with mathematical transformations and statistical calculations to reduce the information to a single number, or small set of number for practical interpretation. The degree of precision inherent in any calculation is limited by the precision of the available data. Total error can be thought of as cumulative. To manage this this in laboratory and field settings, scientific tests and scientific experiments make use of the concept of *significant figures*. Significant figures (SFs) can be thought of as a set of procedural rules that define the numerical precision of our calculations. The number of significant figures, or numerical precision of the final result, is limited by the input data with the smallest number of SFs. Following is a list of rules and examples for the use of SFs

SF Rule 1:

All non-zero numbers ARE significant. For example, the number 45.7 has three (3) SFs. Similarly, the number 586 has three (3) SFs.

SF Rule 2:

Zeros between non-zero digits ARE significant. For example, the number 2001 has four (4) SFs. The two zeros are significant because they are between two non-zero digits.

SF Rule 3:

Leading zeros are NOT significant. For example, the number 031 has two (2) SFs. It is the same as the number 31. Similarly, the number 0.31 has two (2) SFs, because the number .31 has the same value. In other words, leading zeros are merely placeholders. Also, leading zeros between are not significant regardless of

whether they are right or left of a decimal point. This means that the number 0.0031 has two (2) SFs.

SF Rule 4:

Trailing zeros in a number with no decimal are NOT significant. For example, the number 150 has two (2) SFs, and the number 100 has one (1) SF. Absence of a decimal indicates no attempt to maintain precision at the single digit level. In the absence of a decimal all trailing digits of zero indicate no attempt to maintain precision at that level. In this way, the number 1100 has two (2) SFs.

SF Rule 5:

Trailing zeros in a whole number with a decimal ARE significant. In other words, training zeros to the left of a decimal point are significant. For example, the number 150. has three SFs. In the same way, the number 1100. has four (4) SFs – whereas the same number without the decimal, under SF Rule 4, has two (2) SFs. Inclusion of a decimal with a whole number indicates that precision is maintained to the single digit level.

SF Rule 6:

Trailing zeros to the right of the decimal ARE significant. For example the number 1100.00 includes (6) SFs. This becomes important when calculating monetary values, in which $1100.00 means exactly one-thousand U.S. dollars and zero cents. It does not mean approximately 1100 U.S. dollars. Another example, a scientist who measures a distance of 105.0 millimeters indicates that the measurement is known to the nearest 1/10 of a millimeter. For this reason, a measurement of 105.0 millimeters has four (4) SFs.

SF Rule 7:

When using scientific notation all figures to the left of of the 'E' are significant. Information to the right of the e does not contribute any significant figures. This rule is based in SF Rules 1 through 6. For example, the number (ex. 1.04E11) has three (3) SFs. When written out the long way (104,000,000,000), any actual values in the numerical places held by trailing zeros do not play a role in the precision of this numerical estimate.

SF Rule 8:

Defined numbers have infinite SFs. In this usage, defined numbers are reference values. Basic or standard units of measurements such as 1 kilogram or 1 meter or 1 second can be combined to derive other useful measurements. For example, velocity can be measured as m/s (meters per second) where meter is the measured distance and *second* is the reference unit. In this usage 1s = 1.0s = 1.00s = 1.000000000s. The number of SFs for seconds is considered infinite. In other words, the SFs are determined by the measured value and not the reference unit or defined number.

Why does all of this matter?

Understanding the potential precision of our numerical measurements and calculations is fundamental to understanding the potential precision of our scientific estimates and conclusions. For example, an estimate of the U.S. population in 2020 is

about 332,623,537 (https://www.census.gov/popclock/) as of the writing of this manuscript. But does his mean that the population is exactly this number? This becomes important when we use data to calculate estimates of other unknown quantities. If we want to calculate the proportion of males using worldwide gender ratio information for which 105 boys are born for every 100 girls (51.2%), we could then calculate an estimate of the number of males in the U.S. [332,623,537 * .512 = 170,303,251]. But is the number of males in the U.S. exactly this number? Most likely not. The actual precision of our estimate is limited to three (3) SFs because this is the lowest SFs for the inputs to the calculation. In this estimate, the precision of our estimate of the number of males in the U.S. is limited to approximately 170 million. In other words, the estimate of 170,303,251 U.S. males is, in reality, no more precise that the estimate of 170 million.

Without an understanding of significant digits, we would be at risk for misunderstanding or manipulation. We could give the false impression of greater precision simply by including a lot of non-zero values with our numbers. Policy makers and administrators might be inclined to make decisions that could later turn out to be sub-optimal, risky, or even unwise.

What does this have to do with polygraph results and posterior odds?

Application of the concept of significant figures to polygraph results can be seen when the probability of deception or truth-telling are provided in the form of a Bayesian posterior *odds*. An advantage of using the odds, as opposed to a decimal probability or percentage, is that it permits us to express probability information using whole numbers. Also, odds convey explicitly that the posterior probability is an objective quantification of the strength of some possibility compared to the strength of some other possibility. Finally, posterior odds of deception or truth are calculated using Bayes' theorem and the test data to update the prior information, expressed in the form of a prior probability or prior odds. Regardless of whether the prior information is express as an odds (1 to 1) or decimal probability (.5) or percentage (50%) the number of significant digits will be 1. For this reason, posterior information will often be limited to 1 significant digit. And for this reason, posterior odds of deception and truth-telling are most appropriately expressed using whole numbers or integers. Although a single decimal value is sometimes retained when the posterior odds are in the single digit range, this practice has more to do with impressionistic comfort than actual precision.

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Inmate Challenges Sex-Offender Polygraph Testing Under the ADA

By Erika Thiel[1] and Gordon L. Vaughan, Esq.[2]

This is the first of a series of anticipated articles co-authored by an attorney, experienced in polygraph legal issues, and an experienced polygraph professional. The first of these articles considers an unusual case, recently played out in a Colorado federal district court, *Beebe v. Colorado*[3], involving a challenge under the Americans with Disabilities Act ("ADA") to sex-offender polygraph testing. [4]

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[3]The description of the case and court holdings are taken from three separate opinions entered by the court available on Westlaw at: *Beebe v. Colorado*, No. 18-cv-01357-CMA-KMT, 2019 WL 6044742 (D. Colo. Nov. 15, 2019); Beebe v. Colorado, No. 18-cv-01357-CMA-KMT, 2019 WL 6255763 (D. Colo. Nov. 22, 2019); and Beebe v. Colorado, No. 18-cv-01357-CMA-KMT, 2019 WL 6465341 (D. Colo. Nov. 30, 2019).

[4]Mr. Vaughan represents both the State of Colorado and the Colorado Department of Corrections on selected cases. He did not, however, represent any party in *Beebe v. Colorado*. All information regarding the Beebe case is taken from publicly available case filings and court decisions.

Background

Scott A. Beebe was convicted and sentenced to probation for a Colorado sex offense on April 13, 2002. His probation was revoked on November 30, 2007, and he was resentenced to a minimum mandatory two years to life indeterminate sentence to the Colorado Department of Corrections ("CDOC"). This sentence was modified on May 13, 2009, to reflect the opportunity for discretionary rather than mandatory parole. While still in prison and in furtherance of securing parole, Beebe entered the CDOC Sex Offender Treatment and Monitoring Program ("SOTMP"). To qualify for parole, Beebe was required to earn a "Successful Progress" status by meeting seven treatment criteria as set out under the Colorado Sex Offender Management Board Standards and Guidelines for the Assessment, Evaluation, Treatment and Behavioral Monitoring of Adult Sex Offenders ("SOMB Standards"). The second of those criteria required "verification of sexual history through *either* the ... polygraph ... *or* other clinical indicators." The SOMB Standards provide that "other clinical indicators" may include "scores on dynamic risk assessments" and "behavioral observations."

Beebe was required, under the SOMB Standards, to take a sexual history polygraph examination to verify his sexual history. Beebe alleged that he had mental impairments, including Generalized Anxiety Disorder, with Panic Disorder Persistent Depressive Disorder, which includes Major Depressive Disorder, and Obsessive/Compulsive Personality Disorder. He further asserted that such mental impairments "substantially limit [his] concentration, thinking, communicating, and brain function." Beebe contended that these mental impairments caused him to "experience excessive anxiety and worry, restlessness, and difficulty concentrating, accompanied by overstimulation of his nervous system, accelerated heart rate, shortness or irregularity of breath, muscle tension and dizziness, all of which were exacerbated by the prospect of and actual taking a polygraph." Beebe alleged that these mental disabilities caused him to routinely fail his sexual history polygraph and thus not become eligible for parole.

Beebe sought, under the ADA, accommodation from the CDOC by waiving the sexual history polygraph test and that he be assessed by the use of "other clinical indicators" so that he could meet the sexual history criteria of the SOMB Standards. The CDOC denied Beebe's request, arguing in part that the use of "other clinical indicators" to verify risk areas had not been effective because Beebe refused to acknowledge or discuss his other victims or other sexually deviant behavior. As an example, the CDOC noted that results from a prior penile plethysmograph demonstrated Beebe was under-reporting his arousal to children, coercive sexual situations, and acts of frottage. Thus, while the SOTMP treatment team was utilizing and considering "other clinical indicators," those indicators pointed to a need to utilize polygraph examinations because of Beebe's unwillingness to discuss or acknowledge these areas of risk.

Beebe filed suit against the CDOC (and the State of Colorado) asserting a violation of the ADA based, in most relevant part, on a claim that the CDOC denied him a meaningful opportunity to progress under the SOTMP program, and thereby qualifying for parole, by failing to accommodate his

request for a polygraph waiver. Beebe hired two psychologists who submitted expert reports describing psychological testing administered to Beebe resulting in the diagnoses of his mental impairments, which they argued would substantially limit Mr. Beebe's concentration, thinking, communicating, and brain function and adversely affect the reliability of a polygraph exam. One of these experts, who had experience in sex offender treatment modalities, expressed an opinion that there were sanctioned alternatives to the polygraph.

The CDOC endorsed one of the polygraph examiners who had administered failed sexual history polygraphs to Beebe. The examiner set out in his report details regarding his polygraph examinations and that Beebe did not exhibit indications of not being suitable. This included Beebe's performing without problems on an acquaintance test. The examiner also, backed by reference to research, opined that Beebe's diagnosed mental conditions would not substantially impact the results of the polygraph testing and any impact would be more likely to result in an "inconclusive result" rather than the "deceptive results" Beebe produced.

Beebe challenged the opinions of the polygraph examiner on several grounds, including the examiner's lack of an academic degree in psychology or any specialty study or training in psychophysiology. Beebe argued that the absence of such qualifications disqualified the examiner from providing expert testimony regarding a "psychophysiological test of deception." Additionally, Beebe asserted that the examiner was unqualified because there was a question of the examiner's maintaining his continuing polygraph education requirements of the American Polygraph Association ("APA") Standards of Practice. The CDOC responded that the examiner was sufficiently qualified based on his extensive experience as a polygraph examiner which included the administering of more than 4,000 polygraphs.

Legal Considerations and Issues

In McKune v. Lile,[5] the United States Supreme Court held that the disqualification of a state prisoner from a voluntary sex-offender treatment program for refusing to provide a sexual history that included verification by a polygraph examination did not amount to compelled self-incrimination as it did not extend his prison term. And, in *Doe v. Heil*, [6] the Colorado federal district court held, and the Tenth Circuit affirmed, that even where disqualification from a sex-offender treatment program may implicate parole eligibility, the sexual history and polygraph requirement withstood Fifth Amendment scrutiny as they are reasonably related to legitimate penological interests. As such, because the CDOC's SOTMP program took place within the prison system and not as part of an ordered post-conviction treatment and monitoring program outside of prison, Beebe could not assert a Fifth Amendment right against self-incrimination re-

[5]536 U.S. 24 (2002).
[6]81 F. Supp. 2d 1134, 1143 (D. Colo. 2011), aff'd, 533 F. App'x 831 (10th Cir. 2013).

garding the requirement that he provide a sexual history and submit to polygraph examinations.[7]

The ADA requires that a public entity shall make reasonable modifications in policies, practices, or procedures when the modifications are necessary to avoid discrimination based on disability – unless the public entity can demonstrate that making the modifications would fundamentally alter the nature of the service, program, or activity. 28 C.F.R. § 35.130(b)(7)(i). As a result, public entities must provide reasonable accommodations to disabled persons. To prove a failure to accommodate, a plaintiff must produce sufficient evidence that his or her disability is impacted by a public entity's policies, practices, or procedures and that a reasonableaccommodation exists. Once proved, the burden shifts to the defendant to present evidence that the modification would "fundamentally alter" the nature of the public service, program, or benefit.

In order to prove his ADA failure-to-accommodate claim, Beebe needed to establish: (1) that because of his alleged disabilities his polygraph results were adversely impacted and (2) that there was a reasonable alternative clinical indicator to the polygraph that could be used to verify his sexual history. If he could prove these elements, the CDOC would then be required to show that eliminating the polygraph requirement would fundamentally alter the nature of the public service, program, or benefit.

The CDOC moved for summary judgment dismissal of Beebe's ADA complaint arguing, in part, that the polygraph was not adversely impacted by the mental impairments claimed by Beebe and that, in any event, there was no reasonable alternative clinical indicator to the polygraph. The CDOC also argued that any accommodation in the form of a polygraph waiver would fundamentally alter the SOTMP program as it related to Beebe.

Decision on Expert Admissibility Issues

The court agreed that the polygraph examiner could testify as an expert. The court recognized that the examiner was not a medical expert and could not opine on whether Beebe's disabilities caused certain symptoms, but the examiner could testify as to whether Beebe's diagnosed disabilities and related symptoms impacted his polygraph examinations in a way that rendered the results as inaccurate. The court also noted that whether the examiner was current with his "APA certifications" was not disqualifying.

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[7]Once released from prison, the Fifth Amendment's privilege against self-incrimination prevents compelled answers to questions where the answers disclose information regarding uncharged criminal conduct or information that may lead to discovery of uncharged criminal conduct. See e.g. *United States v. Von Behren*, 822 F.3d 1139 (10th Cir. 2016). The Supreme Court in *McKune v.* Lile explained the difference between application of the Fifth Amendment in the prison context noting that, along with the legitimate penological objectives of rehabilitating sex offenders, the adverse consequences faced by a prisoner for refusing to make admissions required for participation in a sexual abuse treatment program (compared to those faced by free citizens) were not so severe as to amount to compelled self-incrimination. 536 U.S. at 25, 38–39.

Decision on the Motion for Summary Judgment

The court denied the CDOC's motion for summary judgment, finding that there were disputed issues of fact that would require determination by the finder of fact as to whether Beebe's alleged disabilities caused inaccurate polygraph examination results, whether the CDOC could reasonably use other clinical factors to verify Beebe's sexual history, and whether the sought-after polygraph waiver, as an ADA accommodation, fundamentally altered the nature of the sex-offender treatment program and its rehabilitation services.

Outcome of the Case

Shortly after the court denied the CDOC's motion for summary judgment, the CDOC and the State of Colorado filed a motion to dismiss the case as moot as they had determined that Beebe had exhibited increased willingness to acknowledge and discuss his other victims and other sexually-deviant behavior and areas of risk that he had previously been unwilling to discuss and was also now willing to identify tools that he could use to help manage his areas of risk. It was also observed by the CDOC that, based on Beebe's more open acknowledgement of risk factors, his current self-report was consistent with his prior penile plethysmograph results and provided sufficient clinical indication of risk. With that, and other considerations, Beebe was found to have met the seven SOTMP treatment criteria to have successfully completed the program. The court granted the motion, and the case was dismissed as moot. Beebe was eventually paroled and is last known to be released on an interstate parole compact agreement out of Colorado.

Discussion – Legal Issues and Practice Pointers

While Beebe has limited precedential value, in part as a final determination on the suitability issue was not reached, it is one of only a few cases[8] in which a sex offender has challenged suitability for polygraph. It will no doubt not be the last.

On the record before the district court, the court was likely correct in denying summary judgment dismissal. First, Beebe was able to establish that his mental impairments constituted a disability under the ADA. And courts have long recognized that the ADA applies to parole eligibility and parole decisions. Second, as there was a material factual dispute between the competing experts on whether Beebe's alleged disabilities caused inaccurate polygraph examination results and whether the CDOC could reasonably use other clinical factors to verify Beebe's sexual history, such factual disputes required resolution through trial. Also requiring resolution through trial was whether the sought-after polygraph

[8]Among the few cases considering this issue is *Repotski v. Montgomery Cty. Prob. & Parole Dep't*, No. 19-CV-1663, 2019 WL 6682145 (E.D. Pa. Dec. 5, 2019). There, a sex offender sought exemption from post-conviction polygraph testing arguing that he should, under the ADA, be exempt from such testing as a condition of his treatment program because he suffers from seizures and a "reflex disorder" and that the stress of the test could trigger a seizure. He also argued that he suffered from anxiety, depression, and bipolar disorder, which he claimed was exacerbated by the polygraph testing. The court did not reach these issues as the case was dismissed on procedural grounds.

waiver, as an ADA accommodation, fundamentally altered the nature of the sex-offender treatment program services.

Where legal challenges relating to polygraph suitability are raised, whether in the context of Post-Conviction Sex Offender Testing ("PCSOT") or otherwise, it is recommended that the proponent of the polygraph retain both the polygraph examiner and a person with scientific background in psychophysiology and polygraph suitability as expert witnesses. Some courts might have agreed with Beebe that the examiner was not qualified to address the science surrounding whether certain mental health impairments and associated symptoms impact a polygraph examination – particularly when there are credentialed psychological professionals attesting to the impact of such mental health impairments and associated symptoms.

A polygraph examiner, unaided by a psychology or psychophysiology expert, will face a daunting task to fully rebut such testimony. In Beebe, the polygraph examiner produced a credible and informative report that drew from some of the science addressing polygraph suitability. However, in the face of the two Ph.D. psychologists, the examiner – while an important link in the expert presentation of evidence – was likely at a disadvantage.

Additionally, the polygraph examiner in Beebe was not allowed to challenge the underlying psychological diagnosis that experts had given Beebe nor the purported manifestation and symptoms of such diagnosis. So, too, the polygraph examiner would likely not have been allowed to testify as to the potential use of medications to mitigate the symptoms and their purported impact on the polygraph examination. If these issues are disputed, an expert with appropriate credentials would also need to be retained – though a mental health professional on the sex-offender treatment team might be able to address these issues.

Where polygraph examiners are called to testify as experts, they should be prepared to discuss whether they meet APA or other published qualifications for administering the PCSOT examination and have followed APA or other published polygraph protocols and best practices. Failure to meet such qualifications or to have followed such protocols and best practices risks exclusion of the testimony or, at best, eroding expert credibility. Additionally, while the APA does not require the use of computer scoring, even for evidentiary examinations, a failure to be prepared to discuss such computer scoring will likely be used in cross-examination to erode expert credibility.

Beebe appears, anecdotally, to be part of an increasing trend by sex offenders and some mental health professionals to challenge the efficacy and/or ethics of using polygraph as part of a team approach to sex-offender treatment and monitoring. However, the United States Supreme Court (as set out in *McKune v. Lile*) and almost all federal circuits and state appellate courts have upheld the use of polygraph in such sex-offender treatment programs, and there does not appear to be evidence of courts retreating from this position.

Therapist Issues and Practice Pointers

The *Beebe* case brings up a host of issues that are significant for PCSOT polygraph examiners and therapists. For polygraph examiners, the starting point on a discussion of suitability should be the APA's PCSOT Model Policy (American Polygraph Association *Model Policy for Post-Conviction Sex Offender Testing* (updated 2021)). The PCSOT Model Policy, as well as the APA's Model Policy on Suitability (American Polygraph Association *Model Policy for the Evaluation of Examinee Suitability for Polygraph Testing* (updated 2021)),[9] discuss the considerations an examiner should account for in such examinations.

The APA's Model Policy on Suitability advises that "[e]xaminers should conduct all examinations in a manner that is sensitive to any medical, mental health or developmental issues that may affect an examinee's functioning or the quality of the examination data" and that "[e]thical, professional, and empirical practices suggest that the application of normative data and normative interpretation rules to persons whose functional characteristics are outside the normal range should be regarded with caution." More specifically, the Model Policy on Suitability provides:

> 5. Unsuitability for polygraph. Examiners should not conduct polygraph examinations on individuals determined to be unsuitable, In some cases it may be necessary to delay the test until the issues of unsuitability are resolved: Conditions that may preclude an examinee from suitability for polygraph testing include the following:
>
> 5.1 Acute or active psychotic symptoms indicating a lack of contact with reality, such as unmanaged hallucinations or delusional thinking that will interfere with interactions or understanding during the test;
>
> 5.2 Severe or profound intellectual disability or developmental disorder, as evident during the pre-test interview or determined through psychological assessment;
>
> 5.3 Any diagnosed severe mental health condition with acute symptoms that would interfere with the examination;
>
> 5.4 Severe injury or pain, or acute illness that would interfere with the examination; or
>
> 5.5 Observable impairment due to the influence of drugs or intoxicants.

The Model Policy on Suitability also details suitability considerations for certain medical conditions, use of medications, and developmental disabilities.

It is, of course, not unusual for a PCSOT examinee to carry a mental health diagnosis. In most cases these diagnoses should have minimal impact on the polygraph outcome.[10] However, it is the expectation that a PCSOT examiner pay partic-

[9]These policies are available on the APA website at http://www.polygraph.org.

ular attention in assessing the suitability of a PCSOT examinee. When a polygraph examiner is unsure of the suitability of an examinee, consultation with the mental health team member – or, if unavailable, a mental health professional – is advised. When there is a potential suitability issue, the mental health professional may decide that certain treatment approaches and/or potential medications may be appropriate to alleviate or decrease symptoms that may impact the polygraph examination.

It may also be determined that, where there are active complicating symptoms, the best course of action is to reschedule the polygraph examination for a later date, when such symptoms may not be active or sufficiently reduced. In such case, it is advised that the mental health professional suggesting the delay in polygraph testing re-assess the examinee before testing. The aim of this collaboration is to reduce potential harm to the examinee (or potentially confounded polygraph data) and still allow polygraph examiners to complete court-mandated polygraph examinations. Another possible strategy is for the polygraph examiner and therapists to collaborate on scheduling -- having the examinee scheduled for a therapy session within 24 hours of the polygraph examination to allow the therapist to assess the impact of the examination and address any mental health concerns that may have come up for the examinee and reducing the impact these issues.

If after mitigating efforts have been undertaken in an attempt to minimize active symptoms sufficient to permit a polygraph examination, and the examiner and mental health professional continue to believe the PCSOT examinee is unsuitable for polygraph testing, it is recommended that the examiner and mental health professional consult with the supervising officer regarding whether other assessment tools might be appropriate and whether modification of court orders is necessary. The availability of this collaborative process is one of the strengths of the collaborative management of sex offenders and is the approach emphasized in the PCSOT Model Policy. [11]

Proactively implementing strategies to address polygraph suitability issues, including but not limited to those suggested here, will likely minimize criticism and potential legal liability to the PCSOT examiner and the examiner's employer. For those examiners who are not part of a collaborative PCSOT approach, it is recommended that, where suitability issues arise, the examiner exercise due diligence to communicate with mental health professionals and parole and/or probation officers on strategies to address such issues. Whether working with a collaborative PCSOT approach or individually, it is recommended that an examiner follow best practices for suitability for all examinees.

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[10]The Model Policy on Suitability also states that "[t]here is no published research suggesting that any medical, mental health, or developmental issues will result in erroneous examination results."

[11] PCSOT Model Policy 3.1 provides: "Multidisciplinary collaboration. Examiners who engage in PCSOT activities should emphasize a collaborative approach to work with other professionals involved in the supervision and treatment of persons convicted of a sexual offense. This approach involves communication between individuals from varying disciplines and systems including treatment providers, supervising officers, polygraph examiners, medical and psychiatric professionals, child-protection/family-services workers, and other professionals as may be deemed necessary."

Practical Polygraph: A Codex of Cardio Artifacts

Raymond Nelson

Cardiovascular activity, one of the autonomic signals of interest during polygraph testing, can potentially include a number of types of data artifacts. Artifacts, in polygraph data analysis, are unexpected patterns of activity that are inconsistent with data of normal interpretable quality. Data artifacts represent a concern to field polygraph examiners for several reasons. First, cardio data artifacts may cause ambiguity and error in feature extraction. For this reason, artifacted data segments are often excluded from analysis. A second concern, related to the first, is that cardio data that are laden with numerous artifacts may be unproductive in terms of numerical scores, and this may contribute to inconclusive test results.

Some cardio data artifacts, such as general instability and dampening, may have global effects that may also increase the likelihood of an inconclusive test result. Most types of cardio data artifacts can be assumed to be the result of involuntary causes because they cannot be reproduced voluntarily. However, some cardio data artifacts, such as physical movements, may occur due to involuntary acts, and may also be reproduced through voluntary activity. These may be of special interest to polygraph professionals because they can be subject to statistical analysis for inference as to their actual cause.

Examples of cardiovascular data artifacts

Involuntary cardio artifacts include respiratory blood pressure fluctuation, ectopic heartbeats, cardio-arrhythmia, and muscle fasciculations. Other physical movements may be either voluntary or involuntary, and are therefore of unknown cause. Common global artifacts include general instability, not associated with physical activity or phasic responses to test stimuli and dampening of phasic activity.

Table 1 shows a list of seven types of commonly observed data artifacts in recorded cardiovascular signals of polygraph examinations.

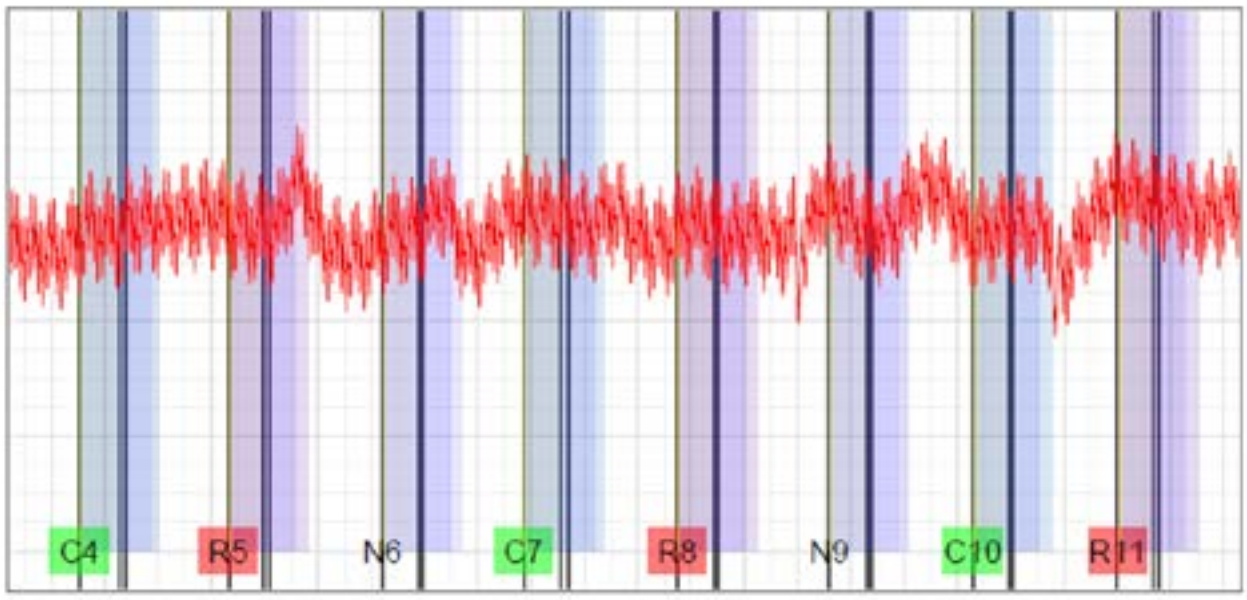
Artifact pattern	Involuntary or Unknown
Respiratory blood pressure fluctuation (RPBF)	Involuntary.
Extrasystoles (premature ventricular events)	Involuntary
Cardio-arrhythmia	Involuntary
Muscle fasciculation (involuntary movement)	Involuntary
Physical movement	Unknown
General instability	Global
Dampened/unresponsive cardio data	Global

Respiratory blood pressure fluctuation

Respiratory blood pressure fluctuation (RBPF) is shown in Figure 1. This pattern of activity has been referred to in polygraph jargon as a *vagus-roll*. It is an oscillating pattern of fluctuation in both systolic and diastolic pressure for which the frequency is observably similar to the frequency of observed respiratory cycles.

RBPF is involuntary and has not been shown to be empirically correlated with deception or truth-telling. In fact, respiratory signals are a common occurrence in cardiovascular data, and are strategically exploited by medical professionals who often use pulse-oximetry to observe and calculate respiration rates.

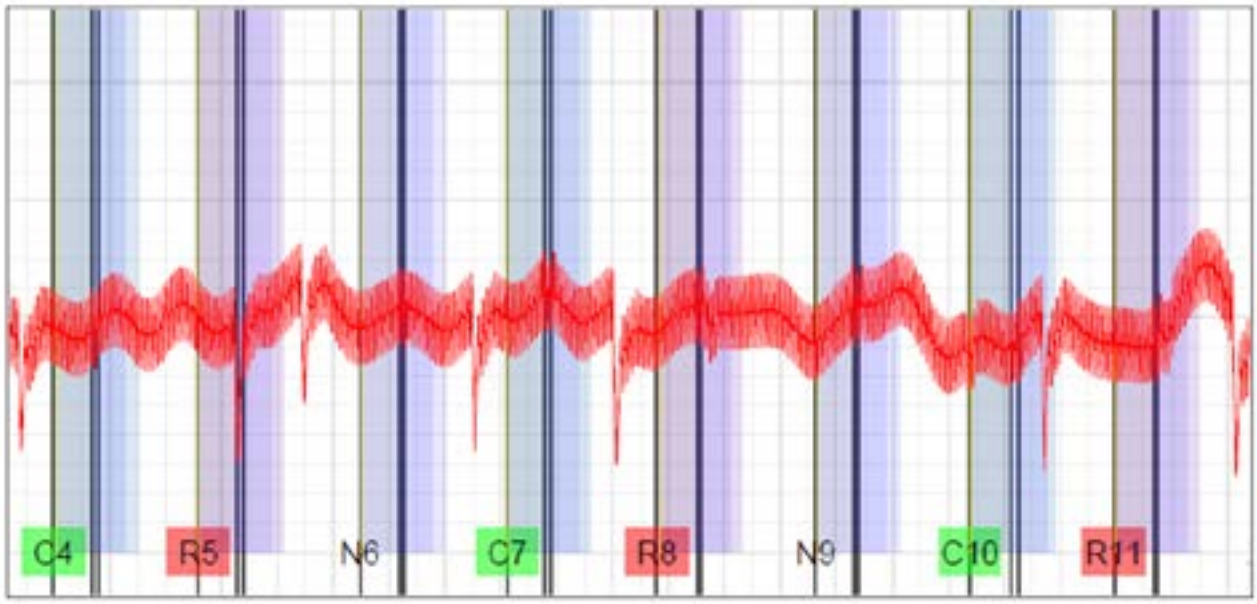
Figure 1. Respiratory blood pressure fluctuation.



Extrasystoles, ectopic heartbeats or premature ventricular contractions

Extrasystoles, also referred to as ectopic heartbeats, are observed as a distinct pattern of changes in the cardio data, consisting of an apparent skipped heartbeat followed by a drop or loss of arterial pressure and then an immediate rise or recovery of arterial pressure. Figure 2 shows an example of cardiovascular data with premature ventricular events. This pattern may be cause by premature ventricular contraction (PVC) or premature atrial contraction (PAC). Regardless of the exact mechanism or cause, ectopic heartbeats are involuntarily and cannot be produced at will.

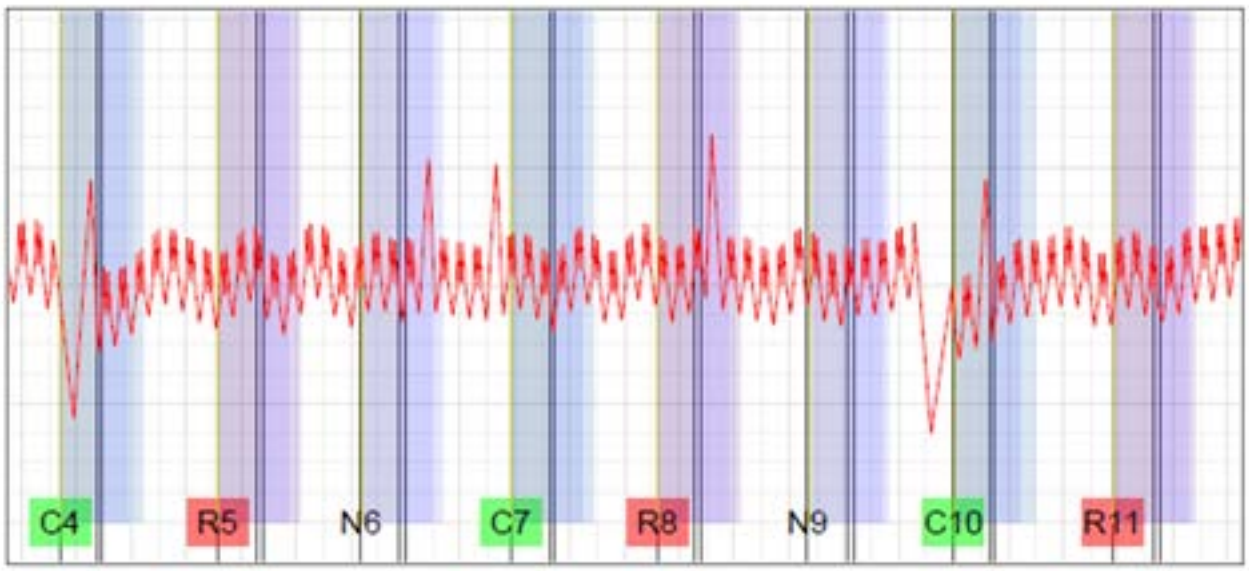
Figure 2. Ectopic heartbeats.



Cardio-arrhythmia

Cardio-arrhythmia is term that refers to patterns of irregular cardiac activity. These can occur because of involuntary irregularities in the electrical signals that initiate the cardio contractions, and also as a result of physical or congenital problems with the heart valves. Several different types of arrhythmia are described in the medical literature. An example of one type of cardio-arrhythmia is shown in Figure 3. Cardio-arrhythmia is involuntary and cannot be deliberately reproduced or induced.

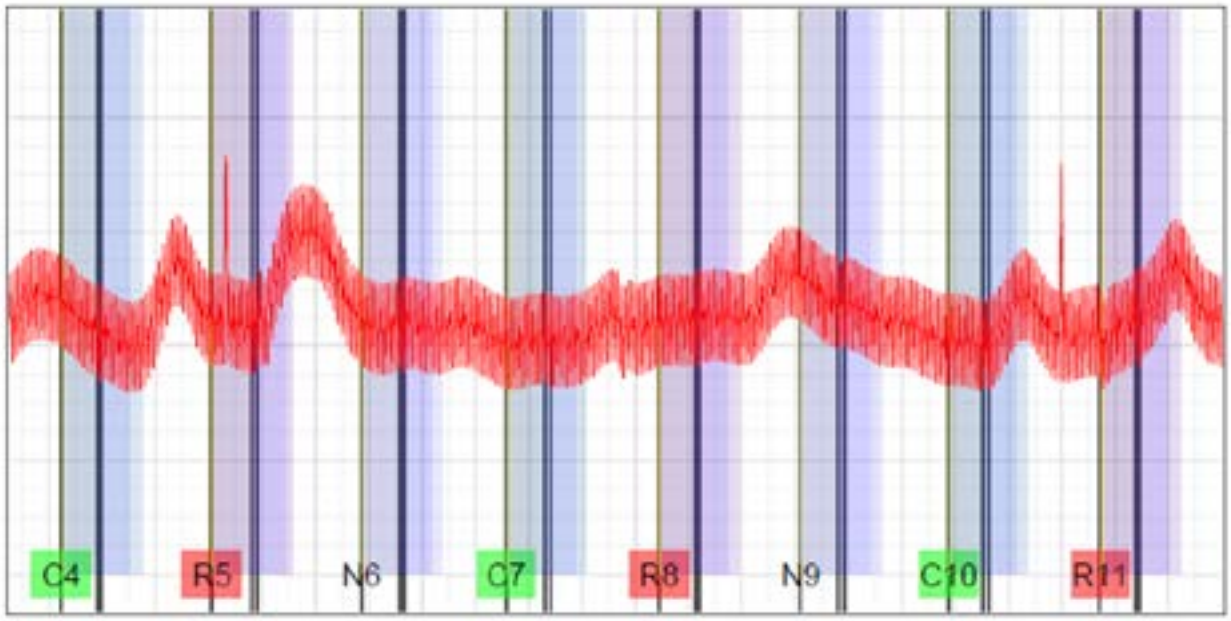
Figure 3. Cardio-arrhythmia.



Fasciculations (involuntary muscle twitches)

Muscle fasciculations, shown in Figure 4, are, by definition, involuntary. In the polygraph context these are observed as a single cardiac pulse cycle that displays an uncharacteristic elevation, relative to the in the systolic line, followed by an immediate return to the normal observed pattern of activity. These movements do not disrupt the activity of the diastolic baseline or systolic peak line.

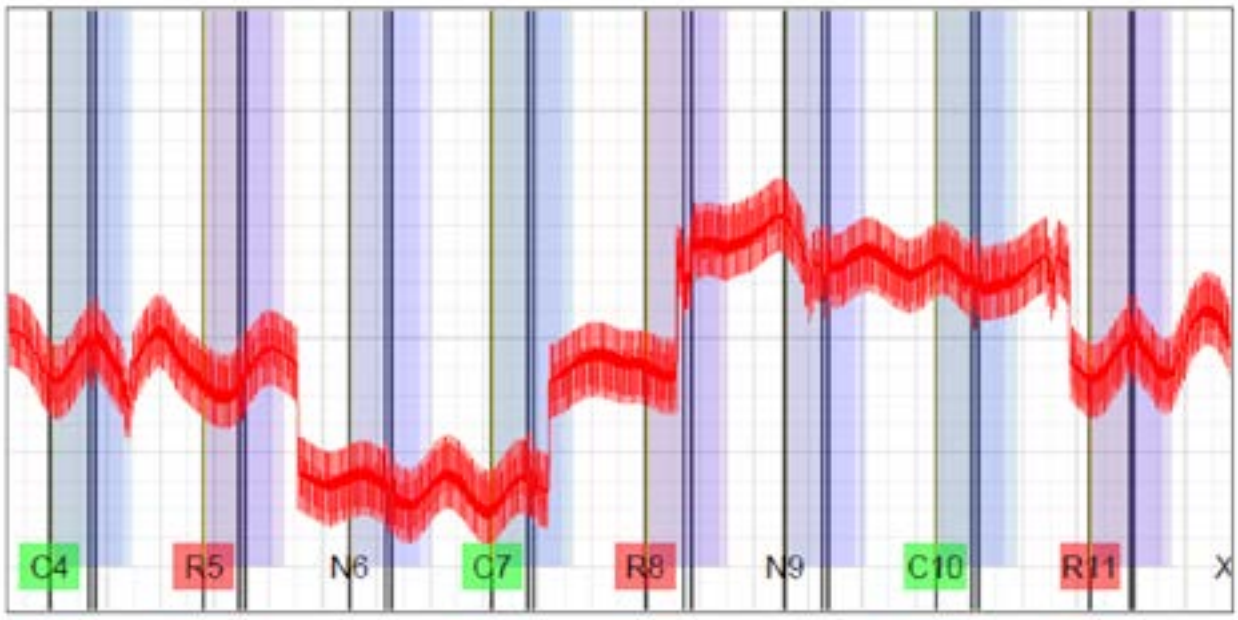
Figure 4. Fasciculations in cardiovascular data.



Physical movement

Physical movement artifacts, shown in Figure 5. are the result changes in physical position. These artifacts are uncharacteristic of responses to test stimuli and are observed as rapid changes that occur within the space of one or two cardiac pulse cycles. They are distinct from involuntary movements in that they characteristically introduce a distinct or dramatic change to either the diastolic baseline, systolic peak line, or both. Physical movements can be reproduced voluntarily. It is also within the realm of possibility that these may occur, at times, due to involuntary activity. Polygraph field examiners can make use of statistical methods to calculate the statistical likelihood that observed physical movement is random or systematic.

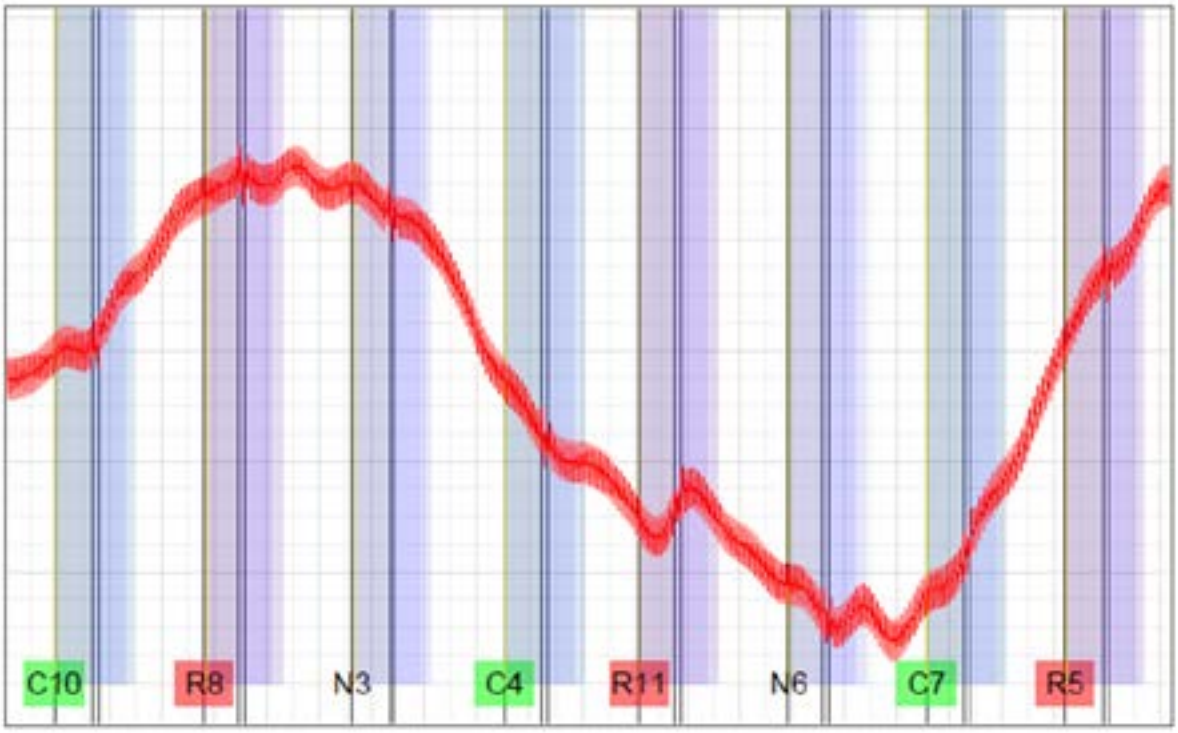
Figure 5. Physical movement observable in cardiovascular data.



General instability

General instability, shown in Figure 6, is observed as a pattern of substantial variation in cardio data, not attributable to a sensor malfunction or other identifiable condition. This activity is independent of the sequence and presentation of the polygraph test stimuli. General instability is distinct from normal phasic responses, and distinct from the more rapid changes that are characteristic of other cardio data artifacts. General instability cannot be easily reproduced voluntarily and has been anecdotally related to blood sugar levels for some persons.

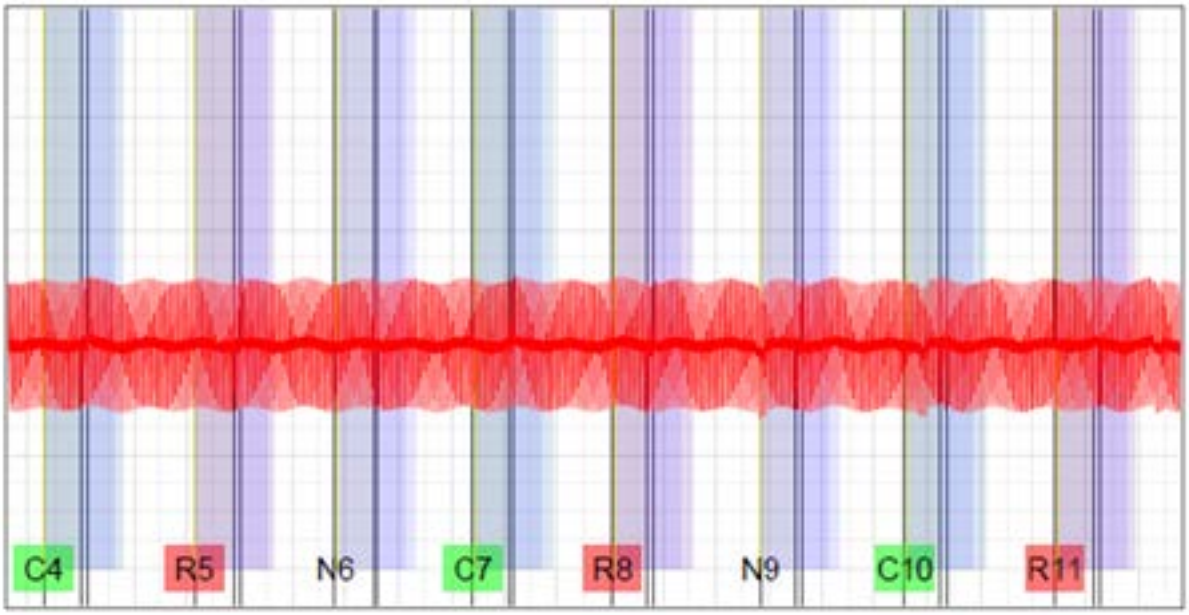
Figure 6. General instability.



Dampened or unresponsive cardio data

Figure 7 shows as example of cardiovascular data of dampened or unresponsive quality. This can be the result of a variety of possible causes, including possible underlying health conditions, certain medications, or combinations of medications, and physical fatigue.

Figure 7. Dampened or unresponsive cardiovascular data.



Conclusion

This project is an illustration of commonly observed data artifacts in cardiovascular signals recorded during polygraph testing. It is intended to promote reasonable understanding and coherent discussion about data artifacts, including possible causes and effects. Some types of cardio data artifacts will have global effects that are indiscriminate of the individual test stimuli. Other cardio artifacts cannot be reproduced voluntarily. And finally, some cardio data artifacts may be induced through either voluntary or involuntary causes. Data artifacts of unknown cause may represent an area of interest around the potential that they may occur secondary to covert efforts to disrupt or alter the test result.

An ideal countermeasure strategy would involve conscious or voluntary control over one's autonomic responses while producing data that are indistinguishable from authentic autonomic data. Although there is intense speculation as to this possibility, the premise of an ideal strategy of this type is inconsistent with the fact that autonomic activity of interest to the polygraph test is generally regarded as outside the domain of conscious control. Voluntary or somatic activity is likely to alter the cardio data in ways that are inconsistent with normal autonomic activity. This represents both a risk and a dilemma to those who attempt to engage in voluntary activity during polygraph testing. Systematic activity may be observed or detected, while non-random or pseudo-random activity will increase the likelihood that the activity will fail to alter the loading of physiological activity in the intended way.

Artifacts that cannot be produced voluntarily are substantially less amenable to becoming strategically exploited and can be regarded as inconvenient noise in the data. As a practical matter, it is not necessary that the exact cause of any artifact is known. Quite often it is impossible to know the exact cause of unexpected activity. This is partially because it is impossible to read the mind of the examinee. It is often sufficient to know only whether an observed artifact can be produced voluntarily.

Involuntary artifacts – those that cannot be reproduced voluntarily – can simply be excluded from the analysis. In contrast, artifacts that can be reproduced voluntarily cannot be immediately and easily ruled out as mere inconvenience. Instead, artifacts of unknown cause can be subject to ancillary analysis to determine the possibility or likelihood that they conform to a systematic distribution or pattern. All polygraph professionals should strive to become familiar with data of normal interpretable quality, in addition to various types of data artifacts and their possible causes. The types of cardiovascular data artifact illustrated herein are an introduction to some of the common artifact signature patterns that skilled examiners will easily recognize.

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- **The Essentials of Polygraph & Polygraph Testing**
- **Morgan Interview Thematic Technique**

Polygraph and Lie Detection in Nigeria

Iyeru Godsglory Oluwole

Let us pray...

•Thank you for blessing us with the knowledge to recognize the truth and detect deception;

•Always help us to remember that our skills have the power to clear the innocent and capture the guilty;

• Strengthen our conviction that each person before us is one of your children and should always be treated with respect and fairness regardless of the charges against them;

• By your grace, allow us to reach inward for the strength and insight with which we have been Blessed;

• Never let us forget that ours is an honorable and noble profession and that our greatest challenge is not to identify the guilty, but to clear the innocent;

• Grant us to have the faith in our art, that under Your watchful eye, the guilty will always reveal themselves;

• With these words we affirm our gratitude to You for Your continued trust in us.

• Bless us who are here to share, to learn and to seek the truth.

By William L Fleisher.

Introduction

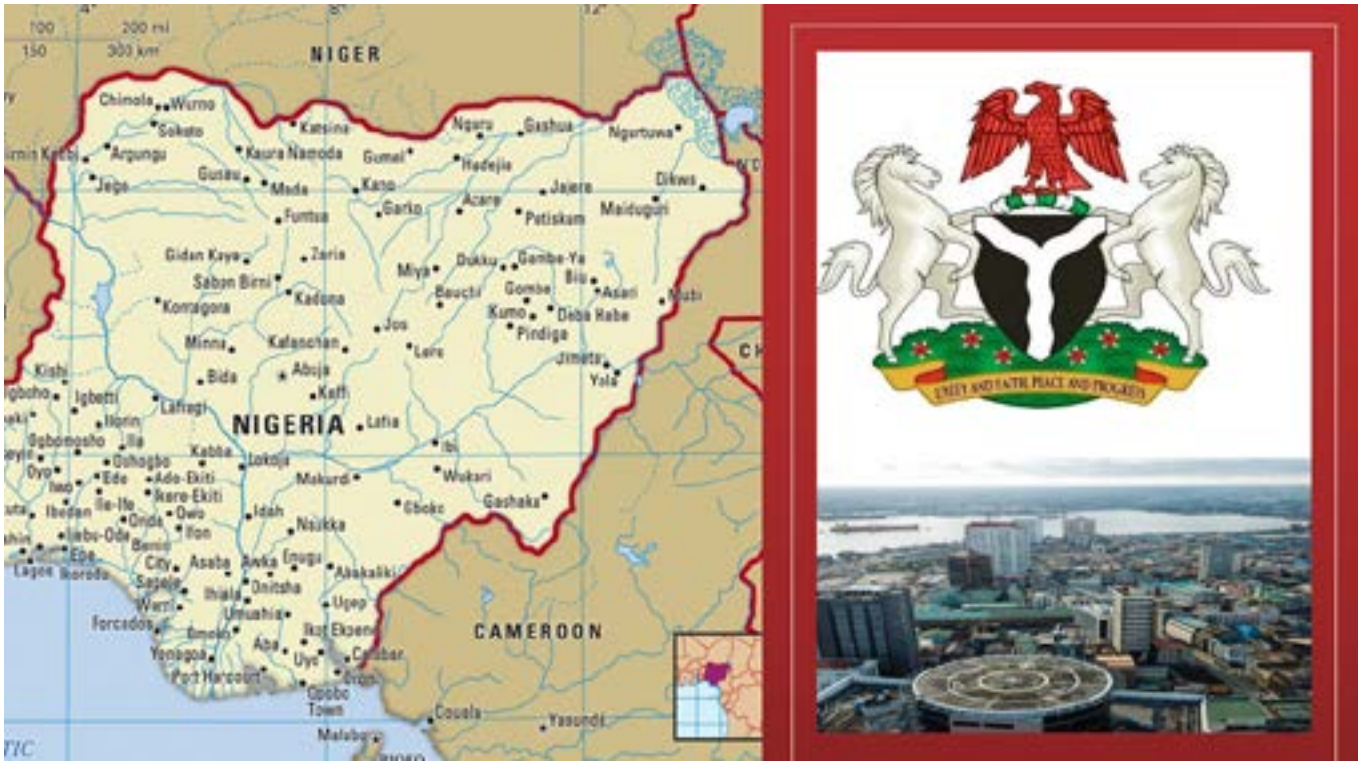
My name is Godsglory Oluwole Iyeru, of Independent Corrupt Practices and Other Related Offences Commission (ICPC) Nigeria. I am a digital forensic expert, polygrapher, data analyst, cyber security expert among others.

Appreciation...
I count it an awesome and a great privilege to participate and speak in a Conference of this magnitude.

My sincere gratitude goes to the organizers of this epoch making event.

I believe this conference shall be impactful and insightful to all of us in this one and big polygraph family.

Thank you so much.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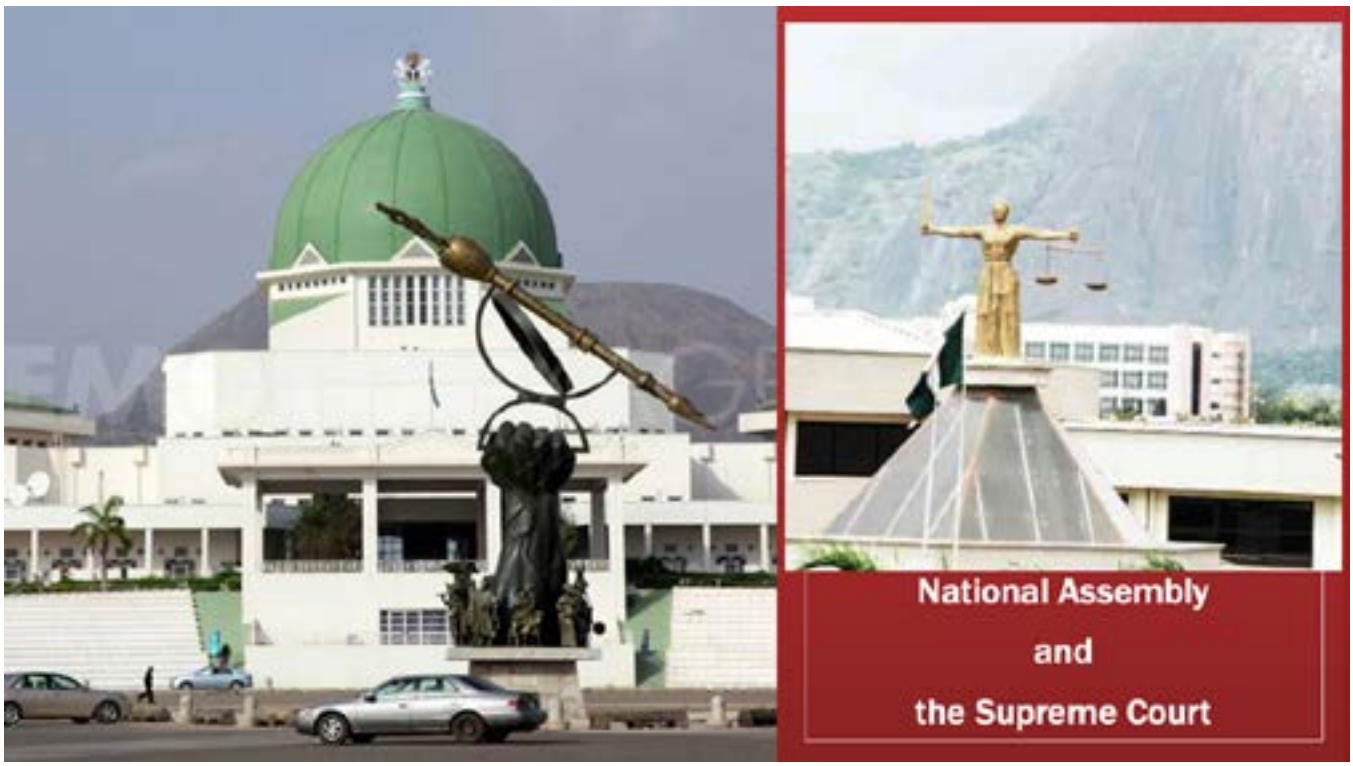

National Assembly
and
the Supreme Court

Background...
The Federal Republic of Nigeria is a State based on principles of democracy and social justice.

The motto: Unity and Faith, Peace and Progress

One of the cardinal political objectives of Nigeria is;

To abolish all corrupt practices and abuse of power.

ICPC...
Corrupt Practices and Other Related Offences Act, 2000, an Act to prohibit and prescribe punishments for Corrupt Practices and Other Related Offences.

The Act establishes an Independent Corrupt Practices and Other Related Offences Commission vesting it with the responsibility for investigation and prosecution of offenders thereof.

The foremost anti-graft agency of government in Nigeria with the responsibility:

To investigate where reasonable ground exists for suspecting that any person has conspired to commit or attempted to commit or has committed an offence under ICPC Act or other laws prohibiting corruption and in appropriate cases to prosecute offenders

To examine the practices, systems and procedures of public bodies and where in the opinion of the Commission, such practices, systems or procedures aid or facilitate fraud or

corruption to direct and supervise a review o them.

To instruct, advise and assist any officer, agency, or parastatals on ways by which fraud or corruption may be eliminated or minimized by such officer, agency or parastatals.

To advice the heads of public bodies of any changes in practices, systems and procedure compatible with the effective discharge of the duties of the public bodies as the Commission thinks fit to reduce the likelihood or incidence of bribery, corruption and related offences.

To educate the public on and against bribery, corruption and related offences.

To enlist and foster public support in combatting corruption.

Professor Bolaji Owasanoye (SAN)ICPC Chairman

Polygraph and the laws in Nigeria
Polygraph comes under secondary and electronic evidence

Evidence Act 2011

Section 84 Evidence Act 2011 is titled 'Admissibility of statement in document produced by compute'. It is under Part V (DOCUMENTARY EVIDENCE) of the Act. It states as follows:

(1) In any proceeding a statement contained in a document produced by a computer shallbe admissible as evidence of any fact stated in it of which direct oral evidence would beadmissible, if it is shown that the conditions in subsection (2) of this section are satisfied inrelation to the statement and computer in question.

(2) The conditions referred to in subsection (l) of this section are-

(a) that the document containing the statement was produced by the computer during a period over which the computer was used regularly to store or process information for the purposes of any activities regularly carried on over that period, whether for profit or not by anybody, whether corporate or not, or by any individual;

(b) that over that period there was regularly supplied to the computer in the ordinary course of those activities information of the kind contained in the statement or of the kind from which the information so contained is derived;

(c) that throughout the material part of that period the computer was operating properly or, if not, that in any respect in which it was not operating properly or was out of operation during that part of that period was not such as to affect the production of the document or the accuracy of its contents; and(d) that the information contained in the statement reproduces or is derived from information supplied to the computer in the ordinary course of those activities.

(3) Where over a period the function of storing or processing information for the purposes ofany activities regularly carried on over that period as mentioned in subsection (2) (a) of thissection was regularly performed by computers, whether-(a) by a combination of computers operating over that period;(b) by different computers operating in succession over that period:(c) by different combinations of computers operating in succession over thatperiod; or(d) in any other manner involving the successive operation over that period, in whatever order. of one or more computers and one or more combinations of computers.

all the computers used for that purpose during that period shall be treated for the purposes of this section as constituting a single computer; and references in this section to a computer shall be construed accordingly

(4) In any proceeding where it is desired to give a statement in evidence by virtue of thissection, a certificate -.(a) identifying the document containing the statement and describing the manner in which it was produced;(b) giving such particulars of any device involved in the production of that document as may be appropriate for the purpose of showing that the document was produced by a computer.

(c) dealing with any of the matters to which the conditions mentioned in subsection (2) above relate, and purporting to be signed by a person occupying a responsible position in relation to the operation of the relevant device or the management of the relevant activities, as the case may be shall be evidence of the matter stated in the certificate: and for the purpose of this subsection it shall be sufficient for a matter to be stated to the best of the knowledge and belief of the person stating it.

(5) For the purposes of this section-(a) information shall be taken to be supplied to a computer if it is supplied to it in any appropriate form and whether it is supplied directly or (with or without human intervention) by means of any appropriate equipment:(b) where, in the course or activities carried on by any individual or body, information is supplied with a view to its being stored or processed for the purposes of those activities by a computer operated otherwise than in the course of those activities, that information, if duly supplied to that computer, shall be taken to be supplied to it in the course of those activities;(e) a document shall be taken to have been produced by a computer whether it was produced by it directly or (with or without human intervention) by means of any appropriate equipment.

Also

Section 258 (e) Evidence Act 2011 defines document as:

(a) books, maps, plans, graphs, drawings, photographs, and also includes any matter expressed or described upon any substance by means of letters, figures or marks or by more than one of these means, intended to be used or which may be used for the purpose of recording that matter;(b) any disc, tape, sound track or other device in which sounds or other data (not being visual images) are embodied so as to be capable (with or without the aid of some other equipment) of being reproduced from it,

(c) any film, negative, tape or other device in which one or more visual images are embodied so as to be capable (with or without the aid of some other equipment) of being reproduced from it; and (d) any device by means of which information is recorded, stored or retrievable including computer output.

Polygraph means MANY GRAPHS

Section 58 Cybercrime defines computer data;

to include every information including information required by the computer to be able to operate, run programs, store programs and store information that the computer user needs such as text files or other files that are associated with the program the computer user is running.

Polygraph data are also such data

The current Chairman of ICPC Nigeria in his wisdom and quest to make ICPC run at par with the foremost anti-corruption bodies across the globe and operate in line global best practices created the Polygraph Unit in ICPC and gave adequate training to certain Officers who are now the best or few of the best in the Country.

The training was facilitated by Nate Gordon of Academy for Scientific Investigative Training in partnership with Tuvia Shurany; a renown polygraph scientist.

I am a Member of both American Polygraph Association (APA) and International Society of Polygraph Examiners (ISOPE)

There might have been few talks about polygraph science in the Nigeria over time but I can say it was recently deployed for its main purpose and intent in less than a decade. This credit should go to Professor Bolaji Owasanoye (ICPC Chairman) whose doggedness and dedication brought polygraph science to where it currently is in Nigeria.

Polygraph examination was recently adopted as part of screening exercise for

public officers vying for the most prestigious post in public service in Nigeria, it actually became a yard stick for the recruitment of such officers to that post.

In the last two years...
ICPC had tested over two hundred examinees:

Internal

Re-validation test for Junior cadre Officers of the Commission

External

Pre-employment test for top public officers/government functionaries aspiring to assume the pinnacle position of public service

2 specific issue tests had also been conducted

This year……
ICPC had already conducted 70 polygraph examination including 2 specific issue test, there are other tests of all categories outlined for each quarter of the year.

Polygraph science is fast gaining ground in Nigeria, this explains why it was a criteria for top public officers' considerations for apex appointments.

Our trade mark...
Professionalism

• Integrity

• Dedication

• Efficiency

• Team work

These core values are essential and we don't take light of them in ICPC and these explains our remarkable achievements in the field of polygraph science in Nigeria.

Our Polygraph Policies/Procedures
•In ICPC we conduct all categories of polygraph examinations:

•Pre-employment

•Re-validation/verification

•Specific Issue

•Forensic Assessment Interview Technique

•PVT etc.

• Integrated Zone Comparison Technique (IZCT) is our preferred option though we deploy other techniques as situation warrants.

• Data Analysis

• Empirical Scoring System

• ASIT Polysuite

• Algorithm for manual Scoring

• Horizontal Scoring System etc.

• Horizontal Scoring System (HSS) is our most use scoring system for the following reasons;

• Allows for every comparison and rel-

evant question to receive a numerical score depicting the degree of each question's reaction.

Allows for objective scoring of any type of test single issue, multi-faceted issue, multi issue and peak of tension test.

It is the only scoring technique that can also be applied to multi issue screening test by making comparisons between the comparison and relevant test questions as well as between each of the relevant test questions thus giving a CQ-RQ determination as well as RQ-RQ determination. (Nate Gordon)

We ensure…..
• Serene/Friendly Environment

• Examinee's fundamental human rights (consent/agreement of cooperation)

• Participatory Pre-test Interview session

• High level professionalism throughout the test

•Confidentiality

•Quality Control

•Global Best practice

Our Discoveries/analytics
Sample selection

• 28 Junior cadre officers (all male) tested for Drugs, Information leakage and undetected crime:

  • 4 out of 28 show NSR to all test questions

  • 17 of 28 show SR to test question on drugs

  • 12 of 28 show SR to test question on undetected crime

  • 12 of 28 show SR to test question on information leakage

•16 junior cadre category (male and female) tested for offered bribe, accepted bribe, know staff involved with bribe and organized crime.

  • 2 (females) out of 16 show NSR to all test questions

  • 4 (3 females, 1 male) show SR to offered bribe

  • 3 (2 males, 1 female) show SR to accepted bribe

  • 7 (4 females, 3 males) show SR to know staff involved with bribe

  • 7 (3 females, 4 males) show SR to Organized crime

• 30 top public officers tested for information leakage, undetected crime, drugs and corrupt practices:

  • 1 show NSR to all test questions

  • 4 (males) show SR to Drugs

  • 8 show SR to Information leakage

  • 8 show SR to Organized crime

• 14 show SR to Corrupt Practice

From the above sample selections:

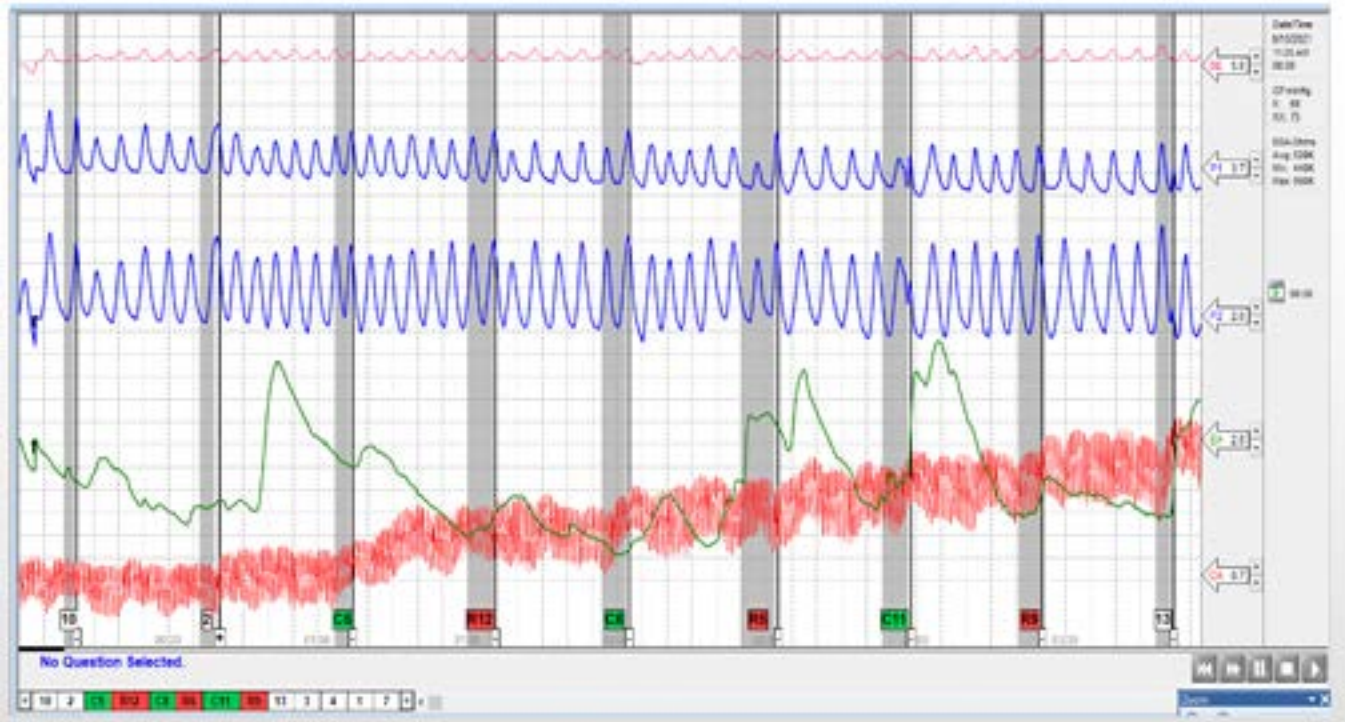
• Junior cadre officers are more likely to be involved in drugs

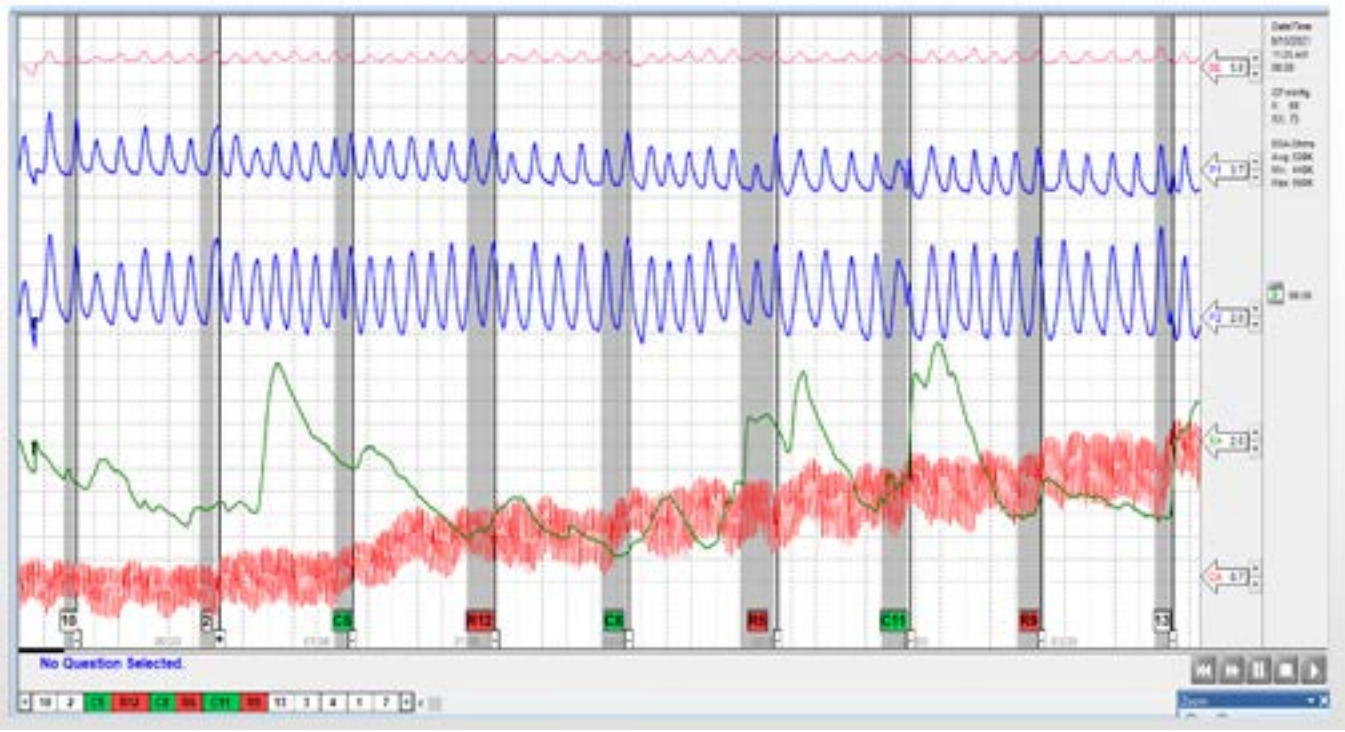
• All officers may have tendencies to engage in any form of crime if they know they will not be caught

• Corrupt practices/whit collar crimes are most likely perpetrated by top public officers.

• Both senior and junior cadre officers have tendencies for information leakage

• Bribe issues in any office are mostly committed by collaborative efforts of both senior and junior cadre officers

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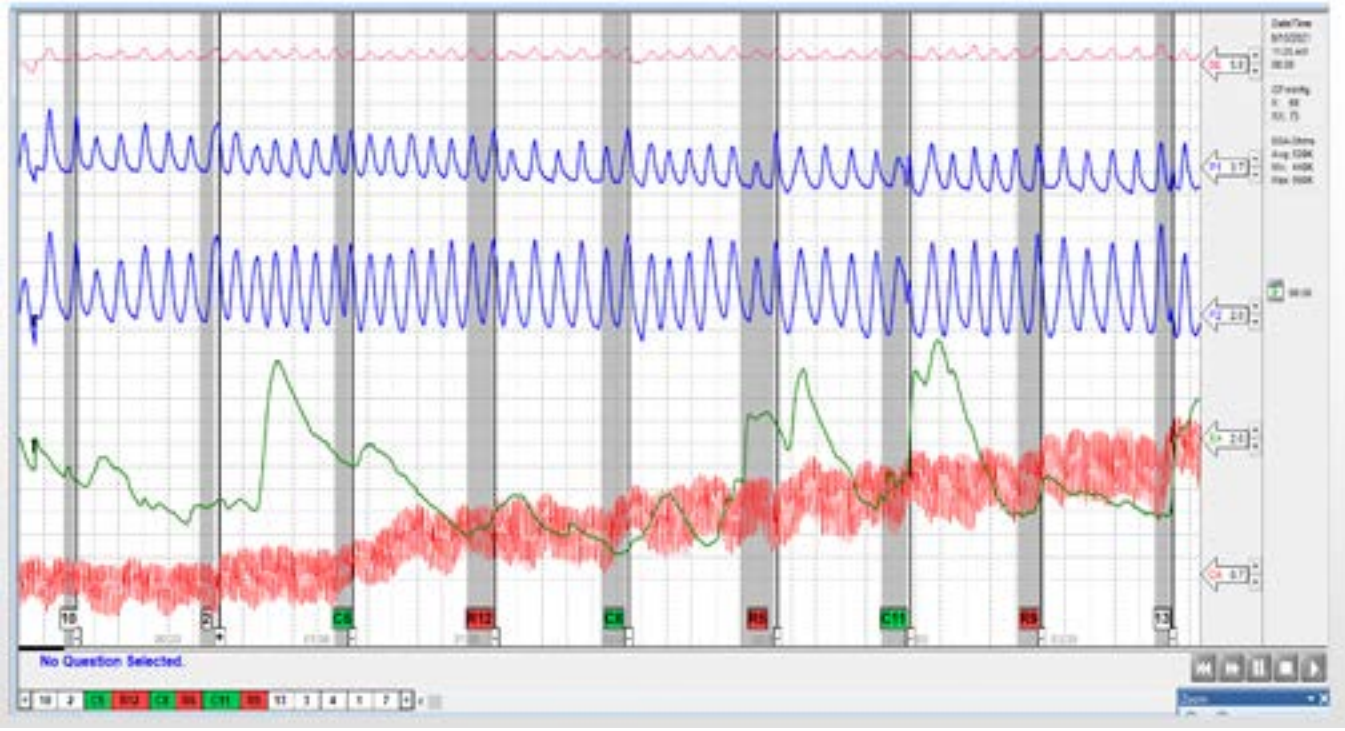
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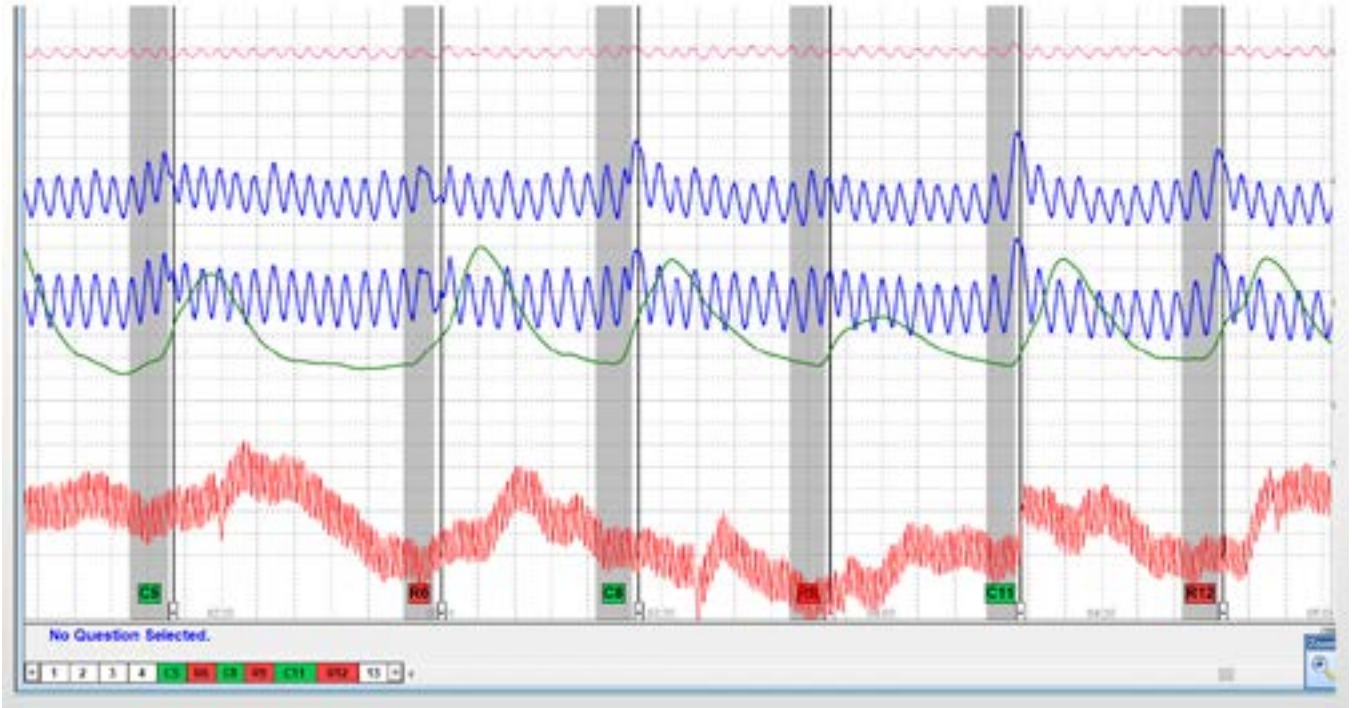
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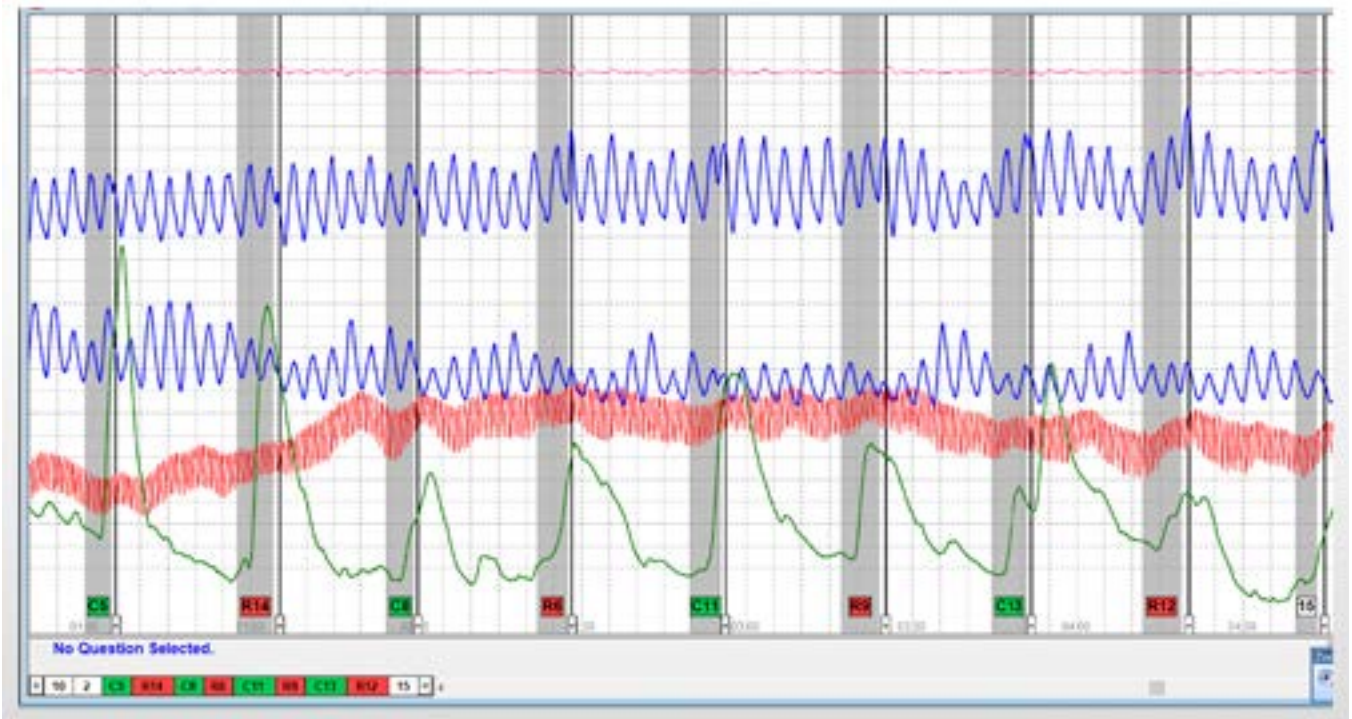
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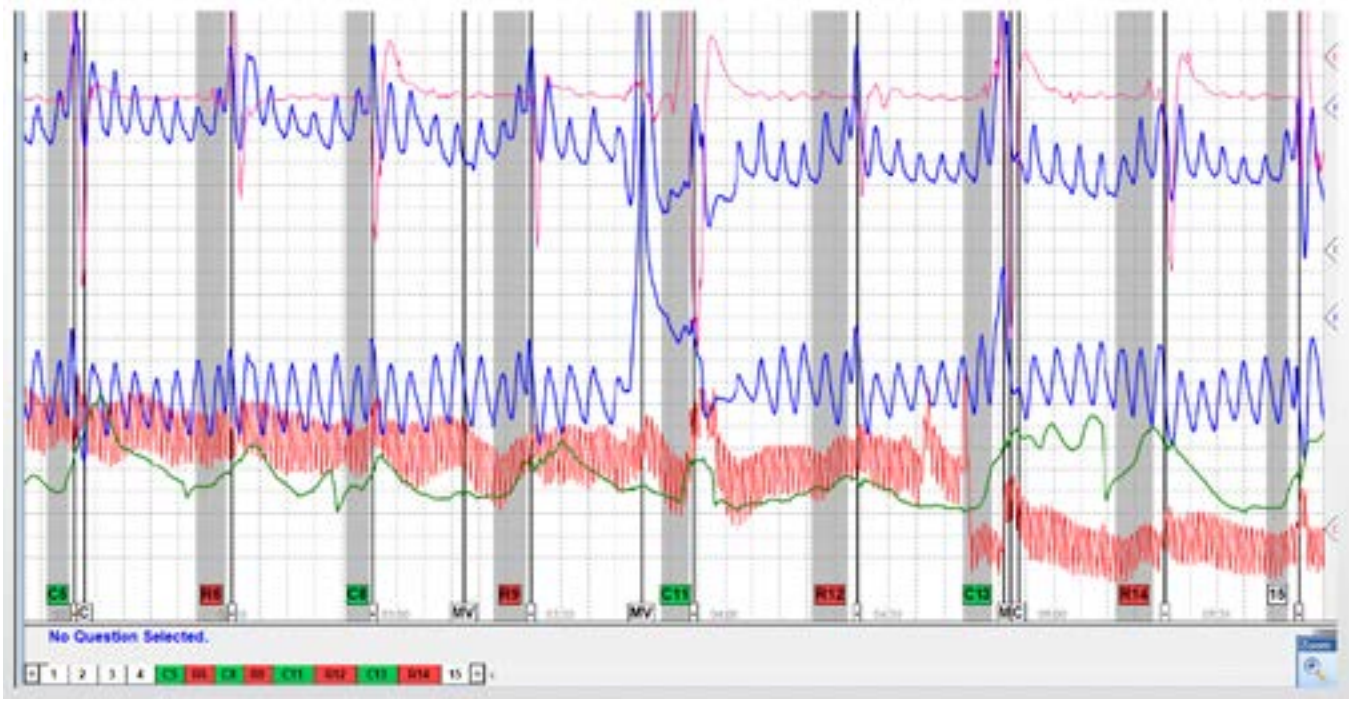
C6
MC
R8
C8
MV
R9
MV
C11
R12
C13
MC
R14
15
No Question Selected.

Some Historical Perspective on the Zone Comparison Test (and Archaic Practices)

Donnie Dutton[1]
Mark D. Handler

I was looking through my initial polygraph school paperwork and came upon a few practices that have not been used in years. Rightfully so, but I thought that I would take a few minutes and at least document what we used back in the 80's. I took my initial polygraph training at the then United States Army Military Police School (USAMPS) back in 1985. I was trained by Mr. Ron Decker who back then was known as the "Wizard" to many of us and had a reputation of knowing more about polygraph than any of us would ever learn during our careers as examiners. As you would expect back then most of our training was focused on criminal specific testing, as screening was just beginning to really take a foothold for the government. One of our primary testing techniques was the Zone Comparison Test (ZCT) and it is this technique, which has changed since I was first taught it, upon which I would like to elaborate.

Back when I was taught the ZCT there were principles that, at the time, were associated with the ZCT, Psychological Set, Anticlimax Dampening Concept, Outside Super-Damping Concept, and the Guilt Complex Reactor. As most of you are aware those terms are now obsolete and were removed from teachings as they could never be scientifically proven to have value added to the polygraph process.

USAMPS definition for Psychological Set was: "A person's fears, anxieties, and apprehensions are channeled toward the situation which holds the greatest immediate threat to his self-preservation

[1]This paper was written in the first person by the first author. The second author accepted the kind offer to include some related research and historical content.

or general well-being. He tunes in that which indicates trouble or danger by having his sense organs and attention tuned for a particular stimulus, and he tunes out that which is of a lesser threat to his self-preservation or general well-being. In other words, he establishes a psychological set."

Handler & Nelson (2007) explored the use of this term, along with Anticlimax Dampening Concept, within any sister discipline of science. In their paper's abstract they wrote:

> "This paper explores the phenomena described as "psychological set" and "anti-climax dampening concept" outside of the polygraph lexicon for more parsimonious terms. Unique to the polygraph field, these terms are discussed in their historical context with an attempt to reconcile their meaning with vocabulary and concepts from related sciences. The purpose of this paper is to propose a modernization of our language to align it with mainstream terms and concepts. The authors argue that the term "psychological set" and "anti-climax dampening concept" are inadequately defined while the construct of salience may be more suited to providing an accurate conceptual framework to describe the psychophysiology underlying the science of polygraph testing."

Senter, Weatherman, Krapohl & Horvath (2010) concluded the terms Psychological Set and Anticlimax Dampening Concept, were used synonymously at US-AMPS and wrote:

> "While the term "Psychological Set" has been accepted in the field to refer to this difference in responsiveness, the term has very limited value. It does not accommodate non-CQT procedures and it is neither understood nor applied in the scientific literature as it is by polygraph examiners."

As our profession has matured, we now know that our attention is drawn to the salience of a question which may or may not have anything to do with fear, anxieties, or apprehensions, one clear example of this would be the use of a directed lie question, none of the above apply however the salience of that question causes a response. A good definition of salience that I found on the internet was the psychology definition:

> "Salience describes how prominent or emotionally striking something is. If an element seems to jump out from its environment, it is salient. If it blends into the background and takes a while to find, it is not. Salience Bias states that the brain prefers to pay attention to salient elements of an experience."

The ZCT also had the concept called the Guilt Complex Reactor question. This concept/theory was based on an examinee who responds to all accusatory type questions regardless of whether they are lying or not. An example of this might be like you were conducting a polygraph examination concerning the theft of money and during your discussion of the crime you not only talk about the theft of the money, but you also point out that something else was also stolen, say a tape re-

corder. Now in reality there was no tape recorder stolen but in the ZCT you would ask a question about the tape recorder to see if he fits the description of being a guilt complex reactor. I will provide an example of how this would fit into the question string a little further in this article.

Most of us know the ZCT to have a total of ten questions but back in the 80's there were a total of thirteen questions that were asked. The ZCT series consisted of the first chart having only ten questions and after the first chart the examiner would then conduct an acquaintance test (ACQT) followed with the second and third relevant charts each having a total of thirteen questions. Here is an example of what the first chart would look like:

1.Irrelevant – Are you now in the state of South Carolina?

2.Sacrifice Relevant – Regarding that stolen money and tape recorder, do you intend to answer truthfully each question about that?

3.Symptomatic – Are you completely convinced that I will not ask you a question on this test that has not already been reviewed?

4.Comparison – Before you XX birthday, did you ever steal anything from someone who trusted you?

5.Primary Relevant – Did you steal any of that money?

6.Comparison – Other than what you told me about, before 19XX, did you ever steal anything else?

7.Primary Relevant with extension – Did you steal any of that money from that wallet?

8.Symptomatic – Is there something else you are afraid I will ask you a question about, even though I have told you I would not?

9.**Guilt Complex** – Did you steal that Sony tape recorder from that room?

10.Weak Relevant – Do you know where any of that stolen money is now?

As you can see from this example the number 9 position was where the Guilt Complex question would be placed. The Guilt Complex question was scored by seeing if the examinee responded equally to both the comparison and relevant questions. Podlesny & Raskin (1978) researched the Guilt Complex question in a laboratory setting. They found the Guilt Complex question to be less effective than traditional comparison questions for the guilty subjects and ineffective overall for innocent subjects.

During this time, we were also taught that Guilt Complex responders were rare and that, more times than not, the examinee is not going to be a Guilt Complex responder. If we did not suspect he or she was a Guilt Complex responder, we could replace the question in position 9 with a comparison question which could then be used to evaluate against the number 10 relevant question. It did not take me long to start using the number 9 question as a comparison question; After all, Guilt Complex responders were rare. If you did use a Guilt Complex question and

the person did react the examiner was encouraged to run a chart just on the Guilt Complex question. Just as a side note, I did use the Guilt Complex question from time to time after graduation but soon dropped it as the ZCT question string allowed me to do so. Another note: I am using the term "comparison" question here, however back then it was referred to as a "control" question.

After the collection of the first relevant chart the examiner would introduce the ACQT which back then was called a "Stim Test." After the collection of the ACQT, if the examinee responded to the key and the data was convincing, the examiner would show the examinee the chart and have the examinee pick out the area where the greatest change occurred. Please remember this was back in the 80's, before everyone had the internet, and I was using an analog polygraph. I would take the chart and fold the chart in such a manner as to conceal the actual numbers that were at the bottom of the chart and have the examinee point where they saw a significant change, which was often seen in the EDA and cardio. Once they picked it out, I would unfold the area I had concealed revealing that the place they picked was in fact the number they had written on the paper. I can tell you that at times an examinee would make new admissions or refuse to allow me to test them further because they saw the accuracy of the test; it was powerful. One interesting thing that I noted is that an examinee on chart one might have had positive numbers during the evaluation but after the collection of the ACQT and then the collection of the remaining relevant charts they had completely reversed and had negative numbers. I have no idea why this happened but talking with other examiners who were collecting data during this era reported they, too, had similar results.

The second area which has been dropped from the ZCT is what was known as the SKY questions (Suspect, Knowledge, You). After the ACQT was collected we would then introduce three new questions. It went something like the following:

"Now Don, I am going to ask you the same questions again that I did earlier, but this time I am also going to be asking you three additional questions which will be asked in a row. Those questions are:

> 11. **S**uspect – Do you suspect anyone of stealing any of that money?
>
> 12. **K**nowledge – Do you know for sure who stole any of that money?
>
> 13. **Y**ou – Did you steal any of that money? (This question would be the same question that you had asked in your number 5 position of the question string."

The SKY questions were always questions 11, 12, and 13 on both charts two and chart three. The examinee would be told that these questions would be asked in the same order in which you reviewed them. The way the SKY was scored was to look at it as if it was a mini-Peak of Tension test. I ran several ZCTs with SKY questions as that was the way my agency at the time required it. However, if I already had a deceptive result, I never looked at the SKY questions. I am not exactly sure when the SKY was dropped from the ZCT nor am I sure when we changed the ZCT

to what we use today. I do know that back then there was absolutely no science behind what we were doing, the method was developed by Mr. Cleve Backster and as a result it was taught at most polygraph schools for quite some time. I know that in the early 90's the federal government did a validation study of the ZCT and to the best of my knowledge that was the first validation study done, however I do not know this for certain. One additional thing we did back then with the ZCT, but no longer do, is we ran the questions straight through - we did not rotate the comparison questions.

Podlesny & Truslow (1993) explored the attempt to parse out individual roles using test question subtotals and reported non-significant results for the truthful participants when asked about knowledge.

Additionally, in a large field study, Raskin, (2019) and his colleagues reported similar conclusions with regards to attempting to discriminate potential roles in criminal events. They wrote:

> "A related problem is raised by the finding of higher false positive rates for questions answered truthfully by suspects who were also deceptive to at least one relevant question in the same test. It appears that answering deceptively to at least one relevant question in the test tends to weaken the reactions to the control questions, thereby making it difficult for them to produce reactions that are larger than those to relevant questions that are answered truthfully. Therefore, field polygraph examiners should attempt to devise sets of relevant questions that the suspect can be expected to answer all truthfully or all deceptively. The case information and the importance of each relevant question should be carefully considered in formulating the set of relevant questions to be asked, and separate question series should be used whenever it seems likely that the suspect might answer some of the relevant questions truthfully and some of them deceptively."

Finally, common sense suggests asking an examinee if they "suspect" someone when dealing with a closed list of potential suspects is a recipe for disaster.

As for the use of the Outside Super-Dampening Concept we were taught to use the two symptomatic questions. The use of these questions was in case the examinee considered an outside issue to be of a greater threat to their well-being. It was taught that if an examinee had poor responses, random responses, or no responses to the comparison or relevant questions and that the greatest responses were to the symptomatic questions then the examinee had an outside issue. Honts, Amato & Gordon (2000) provided evidence that refutes the validity of the Outside Issue Question in the CQT. The authors concluded "The use of outside issue questions was not shown to have utility or validity for detecting or ameliorating the effects of outside issues."

It was supposed to be the examiners job in the pretest to attempt elimination of all outside issues by assuring the examinee that no questions would be asked that were not reviewed. Sometimes this was extremely difficult to do, and an examinee would relate they did not trust

you or did not understand the questions, or they were just looking for an excuse to not continue the test. I had one individual who absolutely refused to accept that I would only ask the reviewed questions, and that if I did ask something that was not reviewed, I would be removed from my duties as a polygraph examiner. Still, he would not agree to trust me. I made a call to my quality control who told me to just tell him to answer the questions the way they were to be answered and move on. I did, he failed, and later confessed. To the best of my knowledge there is absolutely no science to support the use of the symptomatic questions but since the ZCT was validated with those two questions in the validation process our polygraph schools still teach using them.

Today we no longer ask a Guilt Complex question, nor do we ever do a SKY. The reason for documenting these abandoned practices is that I did think it of some importance to capture what the federal government was doing back then before they were lost and forgotten. Additionally, it is important to share with the reader, some of the research that supports abandoning these practices. I hope you found this revisiting of what the ZCT used to be was informative and interesting.

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The Scientific Laws of Polygraph

The first scientific-philosophical principles where is it based its diagnostic methodology

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Summary

Since Polygraph consolidated its technology and the first methodological schemes it has exhaustively tried to be recognized as a science in front of the scientific community relying on tools as statistics and experimental methodology. However, despite the valuable studies performed by various researchers who have provided evidence about the validity of the lie detection by using the polygraphic model, they have not yet achieved in the arduous process of debate the explanation of "why?" and "how?" they've come to this diagnostic finding. This situation has led the tight epistemic screen to not fully accept its scientific character. Before this complicated scenario, the present philosophical text is given the purpose to end this aforetime debate and confer to this discipline the scientific scope that evidence demands. For this reason, the initial study consisted in analyzing the theory and technique of the polygraph examination in which was found a lack of an "elemental" component that every doctrine that boasts to be scientific possess, which are known as "Scientific Laws" which are natural regularities of the behavior of an object of study,

Keywords: mental identity principle, directed thinking principle, Recognition memory principle, potential difference principle, statistical significance principle, scientific laws, first principles, Philosophy, Epistemology, rational-experimental method, axiom, principles, diagnostic methodological engineering, Science, Neuropsico physiological Laws, Statistics

a pristine basis of all dissertation, theory, method, technique, procedure, and technology. To achieve the objective of this project the supreme principles of general science were reviewed focusing consequently on the deep fields of philosophy and thus, those of the Epistemology (the science theory), which allowed, with the use of the rational experimental method and the hypothetic-deductive method, to unveil and to postulate (not to create) the scientific laws involved in the polygraph detection of deception. The results showed that these axioms were laid on a tacit state about the empirical evidence and the methodological praxis. Finally, this philosophical analysis allowed to conclude that the methodological engineering of the polygraph for the detection of deception laid in an implicit presupposition condition under five Scientific Laws of neuro-psychophysiological and statistic character: Mental Identity Principle, Directed Thinking Principle, Recognition Memory Principle, Potential Difference Principle and Statistical Significance Principle.

Introduction

Barely until fifteen years ago the polygraph industry has seriously taken care of reviewing and base with (factual and formal) science its actual theory, basing its new researches in scientific and philosophical methods; besides, it has unified agreements amongst the epistemological guild concerning policies and technical standards, all of this because of times of objection from the scientific community in general -and because of popular culture- inside disagreements and legal obstacles, but yet more, this scientific revolution was due to an unprecedented landmark in the history of polygraph science when de National Academy of Science (2003) from the United States of America issued a report in 2002 about the validity and scientific foundation of the polygraph examination where the committee in charge of the research concluded that polygraph examinations are based on poor scientific basis, despite almost a century of study, since they assured that it hasn´t accumulated knowledge and it hasn´t strengthened its scientific foundations in a significant way, since it has been in relative isolation from its related basic science fields. By last, they ruled that the studies about the accuracy of the technique -available at that moment- lacked scientific rigor as It seemed that the reported data were subjectively influenced.

Derived from the seriousness of the previous rule, in the last years, polygraph researchers have been excessively trying to strengthen the statistical and methodological-experimental sector of the discipline. However, despite the brilliant intellectual efforts it hasn't been achieved to answer to the scientific community the most elemental issue: *"the causes or principles where the diagnostic effect of mendacity is based"*.

In other words, polygraph community, and maybe, many demanding critics, are convinced without doubt about its technical efficiency, however, the enormous limitation lies on not being able to elucidate how and why we obtain this diagnostic finding, i.e. which regular variables of human nature come to play to make feasible the lie detection with the methodological engineering of polygraph.

And of course, this difficult answer has to be provided by Scientific Philosophy, a fundamental axis that, along with experimental methodology and statistics result to be the basis that offers validity and scientific rigor to a discipline (McGuigan, 1983). Contrary, despite the transcendence and importance of this sector in special sciences, polygraph tends to be a less developed field and more disregarded within its theory. Its scaffolding its usually integrated by epistemological concepts that enable to develop and comprehend more complex knowledge about this particular science. Within this conceptual framework, we are able to find the objects of study, purpose, tasks, theoretical framework, specific methodology, scientific method, utility and the Scientific Laws (Monge,2011). This component turns out to be the foundation and principle that support the acting and reasoning of all procedure and or technical operation of a special science (Hempel, 2005). This is the reason why every operation, procedure, technique, and method of a specialty is design under the fundament and support of this scientific principles.

"A principle is, in general, *that from where something comes from* (Aristotle) … Each science has its own principles, which are also called axioms. From them, the other propositions that constitute that science are based". (Gutiérrez, 1993, p.174).

Therefore, this work pretends to add knowledge to the already existent theoretical work that pretends to strengthen the scientific nature of polygraph. In this work, it will be formally be presented the fundamental and superior component that "true sciences" have, its Scientific Laws.

This topic has been developed under the proposal of a nomologic "unified" scheme of those axioms that explain those natural regularities that are found behind the polygraph's deception diagnostic. In this explanative design, it will be rationally evidenced how polygraph lays on a system of natural laws of psychophysiological and statistic origin that base the way to proceed in each one of its phases.

This research is based on the rational method of philosophy, which allowed to contemplate and analyze at an intelligible level the theoretical core of the polygraph technique. As purpose it´s looking to bring to light those Principles or Laws that give support and validity to its diagnostic methodology, nevertheless, its objective it's not to create new postulates, but to unveil, expose and express the supreme principles that lay on a tacit state within the theoretical and technical scaffolding of this science.

As illustrated by Gutiérrez Sáenz:

"One of the most remarkable characteristics of the principles (axioms or postulates) of a science is that it's usually maintained on a state of *implicit presupposition* (at least during the first stages of that science), therefore, they´re not clearly detected by most of the people that are dedicated to the scientific work… If not for these axioms or postulates, there would be no way to settle propositions with a properly scientific character i.e. substantiated… The foundation is the specific attribute that achieves to elevate any affirmation to the rank of science… The foundation of a science can be compared to the foundation of a building. Its stability depends on the quality of those

foundations". (Gutiérrez, 1990, pp. 51, 52, 236)

Definitely, the unknowledge of these fundamental principles, both for home scientists and field scientists, or the public scrutiny entails serious consequences to the prestige and epistemic acceptance of a science in particular.

Here are enlisted some of the adverse contexts that, surely, for many polygraph professionals will be very familiar.

1. The technic-scientific opinions may be easily objectionable in the absence of explicit laws that explain the study phenomenon, opinion, diagnostic, prognostic or treatment derived from it.

2. When the critic is not familiar with the subject, or only knows an specific scientific sector superficially and it has in front of him empirical evidence or sensitive data that comes from its internal reality (physiological or cognitive reactions) that are used to acknowledge the phenomenon, the critic and the external observer are in need to consult and know about the first principles that support the scientific findings, otherwise these findings are easily rejected for not entering into their valid belief system.

3. When a science hasn´t brought to light these *implicit principles*, both to be studied or to be questioned, they generate distrust and uncertainty in their students or consultants.

On the other hand, when a scientist analyzes the principles of its own science, at that moment he´s making philosophical labor (Guzmán, 2001, p.237).

So, revealing and publishing these axioms will allow to scientist to support the technical diagnostics and enforce the scientific character of this discipline. However, it is clear that they don´t have to be considered dogmatic, absolute, or finished, since science in general, follows a process of constant evolution, because, as in most of the scientific laws and theories, they´re subjected to substitutions and modifications, increasingly closer to reality, derived from new observations or plausible facts of falsificationism (Chalmers, 2015), adding that the Scientific Laws are fulfilled within a normative data susceptible to possible **exceptions to the rules**, but, without doubt, are a starting point that will give way to the improvement of the epistemological foundations of science, more specific, to the Polygraph science.

As a complementary simile, the following is cited:

"It is the classic example of the evolution of Physics from Newton to Einstein. The physics principles in the times of Newton (referring to mass, time and gravity) had to be replaced by different ones, following the new investigations… of Einstein. (At the present time we can talk about a space-time integration, the relativity of time, changes on mass, etc.). The ancient principles did not pass on to the ground of falsehood, but to the ground of the simple case, that could not sustain the broader field that had been lately discovered." (Guzmán, 2001, p.236)

Once made the previous punctualizations, is important to report that in polygraph history, various researchers have visualized the study perspective that has been posed in this text. Such is the case of **Robert B. Bates**, whom extraordinarily glimpsed and augured in 1986 in his document Towards a Philosophy of Polygraph Science: Accepted Standards of the Polygraph Profession, the need to establish the **Philosophy of the Polygraph Science**, where the systematic foundations based on basic principles and fundamental premises are established, which allow to initiate a steady theoretical substructure where rules, politics, interpretation criteria, examination format, scoring scale, and other derived knowledge are gathered, so we could talk about a "true" science, capable of overcoming the obstacles of legal, scientific, and public scrutiny.

Bates (1986) argued that the objections, obstacles, and the no acceptance within the legal and scientific community were due to two things; general basic ambiguities related to theory and technique (criteria, scales, formats, rules, etc.) and disagreement and absence of fundamental principles (the philosophy of polygraph), so he called the polygraph industry to leave aside the ego, to establish and formalize a **philosophical substructure** were the polygraph theory rests to support its diagnostic task, and, in turn, to be taught to polygraph examiners and at polygraph schools to be finally recognized as a profession with the proper scientific-philosophical rigor, as the rest of scientific disciplines. The final result ensured that it would be easier to debate the objections and sustain its acceptance.

Finally, the universal hypothesis (scientific laws) here proposed as the pristine basis where the validity of the polygraph detection of deceive is founded are:

1. Mental identity principle
2. Directed thinking principle
3. Recognition memory principle
4. potential difference principle
5. Statistical significance principle

Methodology

"At the moment that a scientist analyzes the principles of its own science he is, ipso facto, making philosophical labor". (Gutiérrez, 2001, p.19)

The aforementioned verse exposes the motto of this investigation text, where the field of Philosophy is disrupted, hence, every intellectual activity written here is

[3] The experimental on the field of philosophy does not refer to experiments like in physics or chemistry, but to the sensitive experience... it is so, this is the first stage in the philosophical method... every knowledge comes from a perceivable data. There are not inborn ideas... before reasoning, mankind has to keep immediate contact with things... and so, at the moment of philosophy is the intelligence (also called, understanding, reason or mind)... that perceives the deep meaning of entities... the supreme causes, the essence, the intrinsic foundation of what is real. (Gutiérrez, 1993, pp. 42, 43, 288-290)

naturally subjected to the **rational-experimental method**[3], which consist on perceive the deepest essence of things, through intellectualization and experience itself; i.e. through the constant reflexion about the data gathered from the experience of a factual object (material facts) or formal (as a form of thinking or a psychological event). It is then, that the philosophical fact of the mind is represented by the cognoscitive activity to look for superior solutions or explanations of abstract problems. Only like this is feasible to reach the intellectual knowledge[4].

Let's take a particular case that would allow materializing the understanding of the rational-experimental method of philosophy:

Let's imagine for an instant that a polygraph researcher establish a statistic in which from 100 examinees, the 30% of the outcomes obtained are inconclusive, and when reviewing the procedure, no technical error was found, however, after being stunned by the ignorance due to the unknowledge of the motive of these non-conclusive results, the researcher decides to explore another physical, medical and psychological variables of the examinee; concatenating that at the end of the study in those 30 cases the examinees had a deficient intellectual coefficient, linked to the deficiency on cognitive attention. In response to this, he decides to review the fundamental processes of attention that predominate during the in-test of the polygraph technique, to finally find that the attentional control under the conditions of the test implies the intermittent change of the focus of attention, besides keeping concentrated for a little longer than five minutes... In conclusion, from the qualia that the researcher reported individually, he manages to induce (from the particular to general) hypothetically the meaning of these concurrent data, where the factor of the alternate and held attention is directly influenced, in a greater or lesser degree, with the inconclusive results. A hypothesis that could be universal if more evidence came to be gathered in individual cases, to the degree of being able to be positioned as a Scientific Law.

The previous simile allows to understand in a practical term, the application of the rational-experimental method and the close interaction between qualia and intellectual knowledge to obtain origin, ultimate, superior, total, essential, or radical explanations or solutions. I.e. making philosophy in sciences.

Getting back to the solemnity that represents the field of philosophy, the philosophical act of contemplation and meditation allowed to fathom and expose the basic foundation (laws or principles) that

[4] Contrary to the qualia, which is a result from sensation, perception, imagination and memory, that distinguishes for being a knowledge of the contingent and of the particular (a specific case); the intellectual knowledge distinguishes because it generates -in the wake of the qualia- knowledge from the universal (to all cases) from the intellectualization of concepts, judgments, and broad reasoning. In particular, from the data that we obtain initially from our senses, we can achieve the formulation of a universal concept (Tarrío, 2015, p. 33,35)

lied intrinsically in the depths of the actual polygraph theory. Most of the principles that will be shown below have an empirical-rational understanding basis; however, some of the axioms – due to their intrinsic-subjective nature – were intellectualized only by the means of the **philosophical method of introspection** and self-evaluation, which, after the reader may contemplate them and analyze them, it will coincide that they are so evident and natural that nobody could doubt about them.

As we know, **introspection** is known as a philosophic method used by psychology to get to know subjective internal conditions and processes (Rodríguez, 1999); such as **psychological constructs**, emotions, conscience, attention, memory, perception, character, mind, thinking, personality, etc.

Therefore, in the empress of philosophizing, exist two types of reflexion (getting back again and again over thoughts) to get to the knowledge and essential meaning of abstract objects. Marcel in Blázquez says that we are getting closer to reality in two ways; "the first reflexion is done when the person keeps itself separated from its reality when it tries to describe it and make it objective… the second reflexion restores the immediacy of the relation with reality. In it, the person assumes an attitude of a partaker of life". (Andrés, 2014, p. 316)

This means that the first understanding is reached when the researcher or the thinker, that are both amazed by the universe, become "spectators"; only like this, the objective knowledge is produced. This modality is related to the factic sciences, to the scientific, to observation, measurement, and experiment.

On the other hand, the second type of reflexion, the researcher ceases to be the spectator to become "actor" or participant of the phenomena. It is in this level where the merely philosophical study problems come into play, since, for the understanding or rational comprehension of an abstract entity, it is necessary to do introspective observations, that, of course, at the end, must be – at a certain level of the research—verified with the real world.

To this point, we could say that the two types of methods and reflexions described by Marcel were the essence of the cognoscitive postures that were carried out throughout this research; the same that made possible – with temper, patience and persistence—to get the essence of the first principles (Scientific Laws) that were content on an appeased state – without expressing—within the diagnostic methodology of polygraph, understanding that these axioms include the involved actors in the diagnosis (examiner and examinee) and the procedures and operations of the methodological process.

As mentioned above, these postulates are not the "reinvention of the wheel" of polygraph science, as they are fundaments that are intrinsic to the theory and praxis of this discipline were the majority of the polygraph examiners applied them and were part from it – many times without noticing it – on the daily praxis, in such a way, that is important to reaffirm, that it is not something new, but rather, the intellectual research focused on understanding them, unveil them and keeping record of them, with the aim of having one of the

epistemological requirements that the philosophy of science establishes for the structure of a particular science.

Development

As it has been mentioned repeatedly, all of the scientific argumentation shown below belongs to the deep and thrilling fields of *Philosophy*. However, the philosophy seen here is not framed on the traditional linguistics of it, because, for many, the conventional texts are difficult to understand, in such a way that the terminology expressed here, promises to be tough. "For polygraph examiners".

What is Philosophy and which is its utility in particular sciences?

Philosophy is a formal science that has an object of study all of the phenomena or entities (everything) that exists inside the internal or external reality of men. Its purpose is to intellectualize (to use of the cognoscitive part of our minds) total, radical, first, superior, or subsequent solutions or explanations about the *true causes* that originate the existence of a particular phenomenon. Its practice is known as philosophizing and it is expressed through reasoning and the use of the speech.

Its intervention on sciences is "at an intelligible level to problems where sciences don't have enough material support that may sustain its hypothesis and need to be substantiated… Solutions are generated over the empty spaces (non material) of the universe of knowledge, where the sciences or the sensible qualities are limited by the material objectivity and it is at this moment that meditation and reflexion (philosophizing) help the scientist to look for an explanation at an abstract level, that may only be understood and perceived at an intelligible level." (Monge, 2011, p. 17)

Philosophy is focused on the fields of the feasible or formal sciences, it is considered as a branch of knowledge that works parallelly with the scientific. It may be defined as a main science of the scientific research. Its purpose is to help on the problem solving of abstract nature (first principles, laws, concepts, constructs, hypothesis, theories). Its application has to be ideally realized by a professional on philosophy, however, on the investigative practice, is the scientist, during the supporting and hypothesis testing who does it, and sometimes, without noticing it.

From here that, Mario Bunge (2010) affirms that the Philosophy of Science (also known as Epistemology) takes care of philosophical issues that emerge on the scientific research and that therefore, all of the scientists, regardless the branch to which they belong, they do philosophy without knowing it.

It is then, that the Philosophy, so elemental on particular sciences, that it occupies a chapter at the theory of a scientific discipline. It has two main participations on them:

A.It helps to solve scientific-philosophical problems during the investigative activity

B.It builds the *theoretical substructure* of the *first basics* where the derived knowledge of a science is based.

However, it has to be mentioned that most people get to consider that Philosophy is an alien discipline to the factual sciences, that only deals with topics of religious aspects, existential, poetic, aesthetic, ethic, fictional, or from Greek times. The truth is that this doctrine does treat these topics, as the branches that they derived from: so much so that Philosophy is surrounded by various types of problems (called *philosophical problems*) with sui generis characteristics, so each one of them has a specialized discipline on the material object of study that represents such problem.

As a representation of the above, see the next scheme:

Table 1. The disciplines and objects of study that comprise the science of philosophy.

Discipline	Object of Study
Logic	Ways of thinking and methods, leading to understanding.
Ethic	Life codes of human life on society.
Aesthetic	Beauty and its relation to the life of men.
Cosmology	Laws, origin and the evolution of the universe.
Metaphysic	Nature, properties, causes and objectives of any entity of reality.
Theology	It studies the entity of the concept of God and the facts related to it.
Gnoseology	Principles, foundations, and methods of the general human knowledge.
Epistemology	It helps in solving philosophical problems during the scientific research: it supports and validates scientific knowledge.
Specific philosophical disciplines (educational philosophy, technology philosophy, etc.)	They establish and represent the theoretical substructure where the first principles of the particular sciences are concentrated.

On the other hand, Gálvez Betancouri (1960) poses a more integral aspect in which it clusters the philosophies in a **free philosophical thinking** and a **scientific explanation attached thinking**; the latter being the category where the neuralgic topic of this investigative text is situated. In it, aspects concerning the foundation of special sciences are treated. As it has been mentioned, philosophy takes care of constituting a kind of **theoretical substructure** in which it rests the system of the *general foundations* such as rules, concepts, models, methodologies, techniques, hypothesis, and theories of a science in particular; besides, it provides validity (speaking of what it's true) to the knowledge that produces the special discipline (as it is the technical diagnosis result, prediction or identification).

Hence, despite most of the scientists get to forget the philosophical basis of their disciplines given the daily routine of their technical tasks, all of the special sciences such as Physics, Chemistry, Mathematics, Criminalistics or Astronomy, rest on a firm solid base of first principles (philosophical substructure). From there that there is a great variability of special branches of philosophy as the philosophy of law, philosophy of psychology, philosophy of language, philosophy of science, philosophy of history, philosophy of education, philosophy of politics, philosophy of medicine, philosophy of mathematics, etc.

For this motive, as postulated by Robert Bates (1986), it is important to consolidate a **Philosophy of the Polygraph Science** where it is established the start engines that cover of scientific validity the technical diagnostics, in such a way and without hurting susceptibilities, it would be trivial and bland, to persist on the development of intricated statistics to prove the accuracy and precision of the polygraph techniques, or to design new and ingenious testing protocols, if it does not exist a philosophical substructure of postulates, axioms or laws that support and nurture such secondary pieces of knowledge.

Epistemology: a philosophical platform to consolidate the scientific character of polygraph

As mention above the also denominated, *Science of Sciences, or mother of all sciences*, **Philosophy** posses a series of specialties that treat the different philosophical problems that have worried it and occupied it since mankind has use of reason. Within these there is a branch that specializes in the study of the scientific knowledge and its obtainment process, the scientific research, which is formally distinguished as **Epistemology**, however, some other schools or currents of thought rather the use of **Philosophy of Science** although some more romantic and passionate are inclined to the use of the nomenclature of *Theory of Science, Science of Science or Scientific Philosophy*.

About this, Pérez (1998) explains that "Philosophy of Sciences and Epistemology are two terms that can be used as synonyms. There's an english tradition, Philosophy of Sciences, there's a french parallel tradition, Epistemologie, and, according to the intellectual traditions on which Latin-American universities have been molded, sometimes, academics refer to Epistemology, sometimes to Philosophy of Sciences" (p. 12).

Its chores are limited to the industry of the material science, on which rightfully Mario Bunge illustrates:

> c)It takes care of philosophical problems that are presented in fact during the course of the scientific investigation or reflexion about the problems, methods, and theories of science… d) it is capable of distinguishing true science from pseudoscience; the deep research from the superficial one; the seek of truth… (Bunge, 2004, pp. 21, 28-29).

As it can be appreciated this discipline is the only branch of the human knowledge that possesses the scope and doctrinal authority to discriminate between a true science and a pseudoscience; all of

this from the **scientific knowledge justification elements** (Villoro, 1999); i.e. the components that integrate the structure or doctrinal body of a truly scientific discipline. These elements allow to give identity and to make feasible the identification and discrimination of the one that boasts of having the character of science.

Namely, the philosophy of sciences establishes 10 minimum indispensable criteria to *demonstrate*[5] the scientific profile of a discipline, which is achieved from an evaluation or epistemological arbitration about the theoretical architecture of the applicant doctrine. These elements constitute together the so-called **structure of science** (Nagel, 1961; Pérez, 2008), concept stipulated (in a particular sense) around the definition of science about its content (McGuigan, 1983), understanding this as de "aggregate of knowledge systematically ordinated within a logical body of doctrine, with its principles, laws, rules, and own methods." (Llamas, 2004, p.67)

This "constitutive elements of science" (*Table 2*) come to represent the philosophical substructure of which the polygraph researcher Robert B. Bates talked about in 1986, within which a predominant factor is found stipulated as **Principles or Scientific Laws**.

Table 2: Epistemological validation model. From Validez científica de la poligrafía (Polygraph Scientific Validity) (p. 34), by Monge, R.C.H., 2012, México.

Structure of sciences
1. Material Object
2. Formal Object
3. Finality
4. Specific Objects
5. Theoretical Scaffolding
6. Epistemic Taxonomy
7. Utility
8. Laws or Principles
9. Specific Method
10. Scientific Method

[5] "Demonstration is a reasoning or series of reasonings that prove the validity of a new knowledge, establishing the necessary connections with other knowledge". (Avalos-González et al., 2004, p. 143). For his part, Gálvez Betancourt defines it as "the set of adequate procedures to determine with certainty the truthfulness or falsehood of a reason, through its foundation on true knowledge." (p.175)

This imperative support is not an optional whim of one or other science, but rather is so elemental that all of the branches of the scientific knowledge, being these human, natural or social, possess, or should possess, this theoretical-empiric basis in an explicit form, because without the discovery and record of these patterns, more or less constant, of the behavior of the study phenomena in particular (scientific laws), it would become impossible to explain, predict, or diagnose new events derived from the first one.

Said requirement is only an ingredient of other more necessary to integrate and validate a science in particular, however, it is warned, that it is the most important of the requirements, as it constitutes the **incipient solid base over which the derived or more complex knowledge is built**, such as methodologies, techniques, theoretical models, hypothesis, demonstrative explanations, predictions, diagnostics, concepts, formulas and even, the development of technological artifacts. In such a way that, the transcendence of the scientific laws is such that it would result impossible that today Medicine could perform a heart transplant to anyone in the world if it hadn't been discovered and recorded the regularity of the behavior (natural law) of the cells of the cardiac tissue at the moment of maintaining an electrical impulse which is constant and independent from the rest of the organism -called automaticity- with the feasibility of maintaining an extracorporal beating (Castellano, Pérez & Attie, 2004)

In the manner of a comparative study, and to have a closer approach to the concept of the **first scientific principles** (also called general laws) of the sciences in particular, the discipline of Criminalistic possess 7 principles that are duly systematized, verified and that, "more or less", are manifested constantly inside the normative data of the material phenomena of the criminal act. The knowledge of these postulates gives certainty to the reconstruction and identification studies performed during the investigative labor. Namely, 7 laws have been announced; the principle of use, the principle of production, the principle of exchange[6], the principle of characteristics correspondence, principle of crime (scene) reconstruction, the principle of probability and principle of certainty. (Bobadilla, 2016)

As an additional example, Sociology has 3 scientific basic laws[7] that govern the phenomenon of human masses: Law of Repetition of Phenomena, Law of Adaptation of Phenomena and the Law of Opposition of Phenomena (Tarde, 1987). From these natural and constant behaviors of the interaction of a social group, is where Sociology stablishes its theories and it is able to describe, explain and predict events on other societies.

Similarly, the science of the fingerprints denominated as Dactyloscopy is based on three universal laws: perenniality, immutability, and diversity[8] (Arriaga, 2006; Antón & de Luis y Turégano, 2004; Antón & de Luis y Turégano, 1998; Nieto, 2007).

[6] The principle of exchange was discovered and enunciated in 1928 by the French criminologist Edmond Locard. (Locard, 1934)

[7] Postulates enunciated by Gabriel Tarde in 1987, in his book La leyes sociales.

Same that support its identification labor, because if this universal regularity about the disposition of the epidermal crests did not exist amongst humans, the assertion of the identification would become a banal fact, and a sort of gambling.

In the same way, Geometrical Optics develops its theory, methods, techniques, and technology from the regularities of the performance of the light phenomena on space, defined within the three nomologic statements that compose the base of this discipline of Physics. This is the law of the rectilinear propagation of light, the law of reflection and law of refraction[9] (Rossi, 2003). Said postulates have allowed understanding the constant behavior of light, which allows developing technologies such as television, computers or photographic cameras.

In the same order, Psychology, Botany, Medicine, Law, Economics, Astronomy, Statistics, Chemistry, and an innumerable list of natural, social and human doctrines (of thought) with true scientific prestige, count explicitly with these principles, which are being particularized and specialized depending on the nature of the phenomenon of study, then, ultimately, only the true specialist knows these elementary minutiae.

Derived from the foregoing, we can see that history itself reflects that the laws or principles of the sciences in particular, are often enunciated and published bravely -by hermit thinkers- on the magnifying glass of the cruel scrutiny of the epistemic community, in which the resistance motivated by the egos has been palpable, because in the end, the faithful ally of time, has decided - late for their lives - said truth.

Up to this point, the term of Law and Scientific Principle has been used without demarcations, and therefore, as it has to be deduced, the reader is surely asking himself ... what is the difference between principle and law? Or are they exactly the same? ... for this, and other questions related to the subject, we give way to the next article.

Principle or scientific law?

Surely, most of those who are attending these lines have had before their eyes, texts of Physics with headlines such as "Newton's Laws", or, some others with the heading of "Newton's Principles" ... It is here, where the question begins, and very few know the exact epistemological response; in such a way, that it is so elementary to give an explanation to this. It would be incomprehensible and foolish on our part, to enter into the complex subject -by the level of abstraction- of the *principles of polygraph* if this basic is not known. Therefore, the following paragraphs are divided.

A **scientific principle**, is understood as the origin, beginning, source or first foundation of where the development and struc-

[8] Originally enunciated by the British physician Francis Galton, cousin of Charles Darwin; in the Revue Scientifique English magazine of May 22, 1981. (Milanta, 1993)

[9] The law of refraction of light, discovered in 1621 by the Dutch mathematician Willebrord Snel van Royen, better known in the scientific world as Snell. However, it was published and known until 1703 by Huygens in his book Dioptrica. (Millán, Escofet & Pérez, 2004)

ture of scientific knowledge more complex of a science; that is to say, it is the "incipient solid foundation" on which a discipline is founded, allowing to base explanations, descriptions, predictions, diagnoses, or technical opinions; as well as achieving control and prevention of phenomena. It comes to be known through the enunciation of an affirmative judgment called a **nomological statement**.

"In each science, there are certain propositions called principles of that science ... the principles of a science are the basic propositions or theses on which the other propositions of that science are based or inferred. They have also been called axioms or postulates. "(Gutiérrez, 1990, p.235)

To further clarify this concept, consider the following anecdote from the author:

Once on an interview with a NASA doctor, he was asked about the possible effects that would be caused to an astronaut if he were to retire the helmet exposing himself to the vacuum of space. Before this questioning, the doctor was prepared to develop arguments in which he described in detail the physiological alterations and injuries that are caused in these conditions. So, the question that arose immediately was: How can you infer these effects on health, if these effects have never been registered under controlled conditions? and even more, if the doctor has no precedent of having been in space. Finally, after several days of philosophical meditation and study of bibliographies in the matter, the answer fell powerfully on the concept of scientific principle; since the arguments that the doctor issued were based on natural physiological laws of the human body and the laws of the physics of space; scientific principles that have been proven universally beforehand. Arriving at the conclusion that this intellectual operation of a dissertation is known epistemologically as a **scientific demonstration** (explanations based on previously proven first principles).

This leads to the understanding that a scientific principle is the basis of the theoretical-empirical origin on which an argumentation or discourse is based, which is intended to give a sense of scientificity; being the bases, the Scientific Laws themselves, the Laws of nature, the Laws of thought or the Laws of society.

Now, a **scientific law** is a reality phenomenon of natural, social or human (of thought) that behaves and manifests universally and regularly, **up to certain limits**; that is, as long as the conditions or variables involved for its production do not change.

In other words, it is a natural, spontaneous fact that can belong to nature itself, to the human or social field, where its manifestation is constant and its universality has been proven by the scientific method, and incorporated into one of the encyclopedia of science theories, to explain, predict, control or diagnose phenomena of equal composition. Its natural appearance occurs independently of the frame of reference of the knowing man because even he himself is part of this natural precoding; that is, that phenomena occur independently of the human will.

To shed light on this concept, consider the following line of ideas:

The study of the behavior of the winds on the terrestrial globe - facilitated by the technology of the satellites - has made it possible to demonstrate that these are subject to certain patterns of action, both to form hurricanes, as tornadoes; in such a way, that the meteorology nowadays can predict with weeks of anticipation or months, how many meteors will be formed and the probable trajectory that they will follow. This fact is a clear example of what a scientific law of nature is and how it is applied to the practice of science and in favor of everyday life.

For Gutiérrez Sáenz (1990), a scientific law is "... a constant relationship between facts or phenomena ... expresses the normal way of the behavior of a natural phenomenon" (p. 239).

For his part, Hempel (2005), qualifies these regularities of nature as "universal hypotheses", whose generality is understood by means of a statement of universal conditional form that can be confirmed by empirical findings, adequate within certain limitations, and that in turn, they constitute the common basis of various procedures considered as typical of the sciences.

It should be noted that Hempel (2005), like Sáenz (1990), restrict themselves to qualifying the "General Laws" of nature as mere "hypothesis", a cautious position that they take because of the following reason: constants become overwhelming evidence, it is not humanly possible to generalize the observation to the entire universe on terrestrial scale, and even more, they think that it would be aberration to extrapolate them outside the earth. For this reason, it is appropriate for the scientist to visualize science in a humbler way and not with an absolutist or overly optimistic position, where it has even been described as the place where the truth lies.

On the other hand, the laws that rule the world are natural rules that govern the action of the phenomena of the universe and that is known through a **nomological statement** that explains an affirmative rule in which is regularly expressed only the positive aspect, leaving implicit the negative aspect. Popper (1987), cited by Echeverría (1998), "affirmed that scientific laws and technical knowledge not only allow us to know what we can do but above all they clarify what cannot be done." (p.163)

"Well, scientific laws play a fundamental role in this determination of the possible and the impossible" (Echeverría, 1998, p.163). For its influence affects not only the framework of scientific "theory", but also the scientific "practice" itself, and also everyday life; because in them it lies the very possibility of existing routinely, since its manifestation occurs in a modular way, in synergy, where all of them, whether physical, chemical, biological or geological, are within a systemic framework. For this, simply think about gravity itself, since there is empirical evidence, as the absence of this force in space - outside the globe - exerts a drastic change in the normality of the body's physiology and anatomy of the organism of an astronaut, where bone density, muscle strength, frequency, and cardiac dimensions are some of the main variations. (Kanas & Manzey, 2008)

With respect to their intervention in the scientific theory -these also called Universal Hypotheses- are usually shared and involved in different specific disciplines of scientific knowledge, where one object of study can be transversal for two different materials with independent purposes and tasks. From there, they can understand and explain more complex phenomena.

On the other hand, in *scientific practice*, its transcendence lies in the fact that, during the investigation of new knowledge, whether the scientist who pursues the advance of science or the professional who applies science (sometimes without realizing it), both act in accordance to the verified Universal Laws to obtain valid and reliable results, more or less approximated to the truth (reality). By attaching to these pristine fundaments, the scientist can fulfill its technical purposes; as they are: predict, diagnose, apply a treatment, design technology, manage or control phenomena.

In such a way, that science and its laws are the best type of knowledge currently available -plausible to be refuted- that help us to the better understanding of nature, so that in the face of a phenomenon dilemma, conclusions can be reached or decisions could be made, and in turn, take the most convenient risks, according to the statistical data recommended to the scientist.

Finally, their impact on *daily life* is such that they govern life itself and allow our days to pass regularly. To elucidate this, let's think for a moment about how the flow of water within homes circulates with ease as if something was pushing it; The reason is simple and is called gravity. For this reason, the water tanks are usually in the upper part of the house with the aim that this force influences the distribution of the vital liquid. Another simile of how the laws of nature influence ordinary life are found in the following scenario.

Remember for a moment some of the sunny summer days you have lived. Surely you will have some experience where someone recommended you change the black shirt or blouse you were wearing, with the firm idea that it would cause you more heat ... Before this, the necessary question is, why does this effect happen? and the answer lies in the fact that the dark shades have the property of absorbing most of the light beam, reducing the reflection effect of the same and consequently causing the increase in temperature. However, this nomological regularity is not usually applied completely to all objects of dark shades, there are exceptions to the rule, especially on paints with polished surface properties, which have the characteristic of improving the reflection of light rays. Precisely, this exceptional singularity is known as the **limits of scientific laws**.

These acceptations or limits of a particular law seem, for many, to be clear contradictions, where they question the scientific statement (the rule) and even the validity of the particular science; However, these limits are the parameters of action of the variables involved in the regular manifestation of the phenomenon, and therefore, strictly speaking, the limits of the fields of action of a natural law (positive law) are the antagonistic beginnings of another law (negative law) that subtracts the effect of the first. These variations are due to a **balance of natural for-**

ces that the universe constantly seeks to modulate the phenomena.

Let us think for a moment of the following ... We have all experienced the Law of gravity, and no one in his reason can doubt the existence of this natural constant; However, if we stop to reflex about the affirmation with which the law of universal gravitation (Newton's Law) is enunciated, where "All bodies are attracted with forces proportional to their masses and inversely proportional to the square of the distance that separates them" (De Llano, 1994, p.150), and we contrast it with the faculty that has the flame of a phosphorus to keep vertical ascending and not descend, despite turning the phosphorus, or the ability of an airplane to keep in the air and not to fall, and even, the behavior of a weather balloon when releasing it to the wind; they seem to be contradictions in which it could be questioned - for the non-scientist - the law of gravity; however, these typical acceptances to the rule are the product of the intervention of antagonistic laws to the gravitational effect.

This position is a reality of science because it hints at a humbler aspect of what a scientific law, and science itself, really is, since it seems that the conception that we have about it is that it is almighty. Situation and position that many used when they try to silence others opinions with expressions like "this is scientifically proven ...", or, "this is based on science". That would mean for many that the debate is over, that there is nothing more to say, letting a glimpse of been "proven" definitely by empirical evidence. The truth is that this absolutist and superhuman appreciation that has been attributed to science has been linked to it more than it really is. (Zanotti, 2014).

On the other hand, given the limits of the human capacity to fully understand the rules that govern the action of the laws of the universe, academically it has been chosen to classify them by subjects, in such a way that each scientific specialty specializes in the study and discovery of the laws that obey the phenomenon of their field; However, the truth is that there are no individual laws, but strictly all that are known specifically (whether chemical, psychological, cognitive or physical) are concatenated and manifested simultaneously in reality - at least on earth -.

That is, "in the field of a specific scientific discipline, laws coexist and represent different levels of generality. The most general laws of a science are those that determine its theoretical principles and differ from the particular laws that govern a wider sphere of its field. "(Díaz, 2006, p.88)

Before this, scientific laws are divided into **natural** (physical, chemical, biological, geological, astronomical), **human** (linguistic, logical, mathematical, etc.) and **social** (economic, law or political). In the same way, Díaz Narváez (2006) shares: "In the world there are **objective laws** (biological, chemical, physical phenomena, among others) and **subjective laws**, characteristic of the intellectual and affective activity of human beings. The laws of reality (objective and subjective) when discovered by human beings and expressed in scientific language are called **scientific laws**. "(p.87)

These first foundations are condemned to go through an arduous and rigorous path before they have been accepted and validated by a highly critical scientific community. Their sources of origin usually come from **experimental scientific research** and **scientific philosophical research**. The first mentioned is characterized by going in search of the discovery of these first principles with the use of the experimental method in disciplines that pretend to understand phenomena that have not been explained and that are immersed in their field of study; the second, is distinguished by achieving the discovery or unveiling of these axioms through the intellectualization (meditation and reflection) of the current theory where a discipline lies and in which these postulates remain in an implicit state.

The clearest example of the latter is the research work carried out in these pages, in which its objective is to capture, enunciate and expose the first principles of polygraph with the use of the philosophical method.

And, to be clearer on the subject of scientific laws, it will be briefly explained the process of creation and validation according to the current of inductivism (from the particular to the general).

The Formal Sciences, and even more, the Factual Sciences, always persecute in a persistent and unattainable way to know the truth of the fact that is investigated; being understood by truth, as the real causes (correlation variables) that allow the manifestation of a phenomenon (dependent variable and *supposed effect*). In such a way, that when the independent variable (or variables) (supposed causes) has a seemingly constant relationship with the production of the dependent variable (or variables) (supposed effects), captured from a few singular facts, until that moment, a valid hypothesis is born, supported by the presence of *moderate evidence*; however, only when the evidence is *overwhelming* - generated from the reproducibility of the experiment, with similar results, by different researchers and different parts of the world - until then, it is feasible, even with some caution, to speak of a Scientific Law, for what "could be concluded that this law is sufficiently universal and necessary to constitute a scientific principle." (Gutiérrez, 1990, p.34)

Derived from the above, the questions that are surely in the mind of the reader are: the experimental methodology of the polygraph is supported by overwhelming evidence, that is, by scientific laws, despite the fact that some of its results are inconclusive or false? And, is the detection of deceiving real?

The overwhelming answer would be yes, because in the experimental sciences there are no absolute, deterministic, main and infallible results, since, because of their "empirical" nature, they are subject to margins of error and confidence intervals, combined with the existence of variables strange in nature that are still unknown to the science of polygraph; Hence, it has to be learned to differentiate between two issues that turn around this discipline: is polygraph scientifically valid? And how accurate is the polygraph technique? ... because a discipline can be scientific by the general and specific principles where it is based and be impaired

in its accuracy and precision to make its identifications compared to other techniques of the guild.

Finally, after these clarifications, it can be specified that both words (law or scientific principle) are correct to make reference to these empirical scopes of scientific knowledge and that the use of one or the other, will only depend on the explanatory approach that wants to be granted in the argumentation, since when referring to the term "scientific principle", it refers specifically to the scientific bases that support the theoretical arguments of a discipline. And, therefore, when using the term "scientific law", we will be referring to the phenomenon, the natural rule of behavior that manifests more or less constantly and necessarily, and is part of the pristine principles of a discipline for to fulfill its purpose and tasks: to explain, predict, describe, diagnose, administer treatments or control natural and nature phenomena, and consequently, the development of technology.

RESULTS

The "first principles" of the polygraph. Imagine for a moment that it was possible to leave blank our understanding of the specifications that have been made previously, and by listening the enunciation of the topic: *The Scientific Principles of Polygraph*, it will surely be associated with rules of procedure applied to any of the phases of the methodology, or, to aspects of historical background, or even, to physiological, psychological, cognitive, technological and statistical foundations; However, as we have understood, the first principles that are alluded to in this work are about *the previous truths or fundamentals of origin to all derived scientific knowledge.* (Márquez, 1973, p.187)

The previous thing leads to lecture that there are two types of scientific principles; **general and special**. General principles are also called immediate causes or immediate foundations (Gutiérrez, 2001), which are shared even with other sciences to structure their theoretical scaffolding and seek immediate explanations for their study phenomena. They are usually found here, statistical data, general concepts or shared theories.

For its part, the principles that arise in this research, are ulterior, supreme or radical foundations, because they do not depend directly on the sensory plane, its understanding is given at the cognitive level not at a perceptible level, through the intervention of the different forms of contemplation and rational analysis, motivated by sensitive data that awaken the philosophical spirit. To these bases, it is called **special principles, ultimate causes or ulterior foundations** (Gutiérrez, 2001), which comes to form part exclusively of the particular science that represents them, of the phenomenon from which their study derives and which also applies to support his theses, opinions or causes.

In areas of our doctrine, the *proximate principle* that supports a diagnosis of mendacity corresponds to the reliability and statistical validity of the technique used, to the quality control of the procedure performed, to the recommended technical policies for physiological data collection, analysis and interpretation, and even, we could add the last validated diagnostic cuts. However, the *supreme principles* correspond to those *laws or natural*

rules, more or less constant, that govern the act or manifestation of the phenomenon of study that occupies our subject and its methodology, and where all the general principles are supported.

Therefore, the theory of polygraph is supported by a system of scientific laws duly linked within its diagnostic methodology and that strongly involves the participants in a polygraph examination. Like most axioms, they are not perceptible, but they are knowable; that is, that their knowledge and understanding is not achieved only through the sensitive path of a particular case, but that the intellectualization of a series of experiences is necessary. These postulates include objective laws and subjective laws, which in particular are of a cognitive, physiological, psychological, philosophical (philosophy of mind) and statistical nature, and which, ultimately, come to ground in general, to a large part of the techniques that constitute the **Science of the Lie Detection**.

Finally, enough propaganda and good rhetoric. We give a formal step to the neuralgic section of this research, in which it is anticipated, by the degree of specialty, that it will be complex for the non-polygraphist to immediately grasp the essence and presence of these principles within the methodology of the technique.

1.The mental identity principle

"The mnesic - mental identity of a person is uni-existent, unrepeatable and identical to itself. He is who he is, and he cannot stop being, and be another, nor will there be another at the same time. "

21 And while they were eating, he said,
"Truly I tell you, one of you will betray me."

22 They were very sad and began
to say to him one after the other,
"Surely you don't mean me, Lord?"

23 Jesus replied, "The one who has
dipped his hand into the bowl with
me will betray me.

24 The Son of Man will go just as it is
written about him. But woe to that
man who betrays the Son of Man!
It would be better for him if he had
not been born."

25 Then Judas, the one who would
betray him, said, "Surely you don't
mean me, Rabbi?"

Jesus answered, "You have said so.
(Matthew 26: 21-25, The Bible of
the Americas)

The depth of the words of this biblical quote synthesizes the essence and transcendence of this universal axiom, in it, we can perceive at a cognizable level that identity quality of consciousness, of experience and existence that men possess to be unique and unrepeatable in time. and space. This property condemns to recognize as their own facts experienced (and sometimes, although we wish we had not lived them) because of memory, which becomes part of our mental-personal identity. In such a way, that **I am who I was, and who I am now**.

To ease even better the understanding of this postulate, perhaps an incident of my own life helps to illustrate it.

Nearly nine years ago, during my university years, several computers were stolen from the computer center of the university. The investigations of the ministerial authorities and the presence of the forensic experts during several days in the facilities of the school, generated an enormous suspicion and distrust amongst the personnel because the preliminary investigations suggested that this theft was accomplished by someone from the student body or professorate... Before this, the question that everyone was asking, was: Who of all the colleagues or teachers present in the institution had stolen the computers? ... At the end of the week, the dactyloscopy expert proceeded to take the fingerprints of 25 members of my group -including me-, establishing positive diagnoses for two specific colleagues. At the end of the interrogatory, both people ended up admitting the facts.

The important thing about the previous experience is the identity that these two subjects had with respect to the rest of the students and teachers - also suspects - but that, nevertheless; only these two possessed the mental individuality of being the authors of the robbery; experience stored exclusively in the memory of the perpetrators; same that happened to be part of their biography of life, and therefore, of their **mental identity**.

Emerick (2016) illustrates us in this regard:

The mind has a special function in our experience. It is responsible for collecting and storing information of and about physical identity, social identity, the Soul and everything we experience, and then *coordinate* and use that information to produce a vision of reality that allows us to walk through life ... There are not two people who have exactly the same beliefs or think exactly the same way because each individual has *different* experiences of life in society. In the same sense, the mental identity varies infinitely from person to person ... The social identity of each person is different because there are not two individuals who have exactly the same social experience ... The mental identity of each human being is unique because it is made up of specific information that has been collected, stored and coordinated by the mind of each individual and each one has had a unique experience in life (pp. 64-66).

It is so that the mental identity, of being myself, and of being aware of what I was, what I did or what I am as a result of that, acquires a degree of individuality for the **facts themselves**, the events, experiences, or whatever we call it, because they are in themselves, **unique, singular and unrepeatable**; moments that are individualized by the spatial context and time itself. This situation means that despite the fact that several people have historically witnessed a dramatic event, such as a fatal accident or homicide, these events have occupied a place in time and space individually, and that from the internal perspective of the subject, are recorded in the **human memory** that gives an **identity label** to the individual; perhaps, one of them as a witness, another as the author of the homicide and one more as an accessory ... we do not know it until we discover the identity that they keep.

Mestre (2016), a philosopher of Spanish origin, masterfully explains that "memory is the ability we have to remember some-

thing that has already happened in the past ... Personal identity is born from the conception of long-term memory. Long-term memory is what allows us to remember what has happened to us, both recently, and a long time ago.

We are because we remember that we were and we are what we felt when we were; we remember, and remember what we do is feeling identified with the being that did what we remember ... What I am, is a product of my memory ".

For his part, Erikson (1968/1971), cited by Ruiz (2014), warns that "the sense of personal identity provides both a sense of oneness and individuality and an awareness of having a different personality" (p.21).

This self, is a unique and original state of origin, that lies only in the mind of those who remember an anecdote and that it is impossible and unthinkable that the other also relives and resents what the first one lived ... this means, that when remembering a dramatic or unusual event, is only possible that the mnesical scene exists mentally in the person who experiences it and not in the other who never lived it; situation **and cognitive condition that belongs to the identity of the mental bearer.**

So far, the reader might think that this **universal principle of the mind** is a postulate inspired romantically by the author, but the truth is that this knowable phenomenon is treated by the **Philosophy of the mind**, within t**he mind-brain identity theory**, also denominated, psychophysical identity theory, thesis of the mind identity, or simply, identity theory. (Broncado et al., 1995)

In its most general form, this principle of identity is also a field of study and application of the science of Logic (a discipline of philosophy); is the first of the four principles called: **fundamental laws of thought**, or also named as the supreme principles of logic, supreme principles of science, first principles of science, principles of knowledge, principles of thought, supreme logical principles, supreme principles of logic, laws of understanding, of intellectual activity or supreme principles of thought. The remaining axioms are, third excluded, of no contraction and of sufficient reason. The first three, including the identity, were promulgated by Aristotle; the last one was announced by the German philosopher Wilhelm Leibniz (Barco, 2004, Di Castro, 2006, Gálvez, 1960, Gutiérrez, 1993, Márquez, 2002, Márquez, 1951, Monge, 2011, Montes, 1977).

The principle of identity "Everything that is, is equal to itself and different from the others" ... (Márquez, 2002, p.25). Logic tells us that this postulate is applicable to every material (ontological) object that exists in the external world, but also to thoughts, to the mind itself, and to any logical entity.

In fields of the **Philosophy of the mind,** this human property is known as **"oneness of the mind"** (Márquez, 2006), which is a property that lies in human memory and that is possible, thanks to the existence of historical consciousness; that is, the capacity of the subject to perceive and recognize as their own the actions carried out in the past; in such a way, that in this mnesic entity, lies our **identity characteristics**, such as **personal information,**

social or personal experiences (positive or negative) that allow as a whole to give rise to the **"sense of identity"**; This quality makes it feasible to configure who we are, to elaborate our biography and to preserve experiences. (Fernández, 2011).

"We cannot live without awareness of what we have lived ... our life would lose its meaning" (Varela, Ávila & Fortoul, 2005)

Specifically, in this cognitive entity metaphysically is where the essence of existence lies, of being oneself and different from others. In it, lies all that we are, what we did, what we were, what we have learned, pretend to be and where we come from. So much so, that in memory - and especially episodic memory - negative and positive experiences are stored throughout our lives; in such a way, that thanks to the attribute of this **mental individualization**, it is feasible by means of the methodology of polygraph, - dealing with a specific case - to identify or discriminate the guilty of the innocent; or in a case, in a screening test, to detect the truthfulness or mendacity on specific subjects of examination ... In other words, if it was not for this Cognitive Law, the existence of true positive and negative diagnoses would not be possible, because the most objective and conclusive evidence to demonstrate the validity of this principle and the existence of this mental property is the meta-analysis of the American Association of Polygraph published in 2012, since it uses numerical data to demonstrate the accuracy and precision of polygraphic techniques and to validate only those that have certain standards, the ultimate goal of this study was to demonstrate to the scientific community in general that it is feasible and real to detect indirectly and probabilistically the lie by means of polygraph methodology.

Adding to the understanding of this axiom, imagine an extraordinary case, where we are investigating a homicide with two suspects, both homozygous twins, with homonyms, and in an extreme case, with physical evidence that demonstrates their presence at the crime scene. However, only one of these two subjects has the mental identity of being the material author of the event, because it has in its episodic memory the record of the space-time information of the criminal event where it was a transgressor and whose information can only be stored by means of memories. in the mind of the true criminal and not in that of the witness ... his twin.

As a further corollary, it is important to affirm that the mental identity of a person arrives to predetermine its polygraphic result, even before the examinee enters the evaluation room, since the result is given by the life experiences stored in his memory ; in such a way, that all individuals possess a conditioned mental identity, either by morality, as good or bad; criminally: guilty or innocent, or polygraphically; as truthful or mendacious, being impossible to be both at the same time; which means that the examinee previously has a cognitive uniqueness different from the others (as honest or corrupt) and the examiners work lies in directing and organizing the thoughts of each person to unveil their memory identity accordingly.

Let's reflex for a moment on the following scenario of everyday life in order to demon-

strate the existence of this principle. How many times have we experienced when an aroma, a melody or a physical place, brings to our mind memories of very personal pleasant or unpleasant events, that even, having people contiguous to us at the exact moment of perceiving the stimulus as a whole, the evoked life episode is unique and unrepeatable for him whom associates it mentally; in such a way, that if there was the enormous coincidence that another person also associated the sensory event, the biographical memory would be individual and different from ours ... this is the mnesic-mental identity principle.

Finally, we must make it clear that the identity of a mind is given by the cognitive entity of memory and predominantly by **personal information** (such as proper name, age, sex, sexuality, identity of parents, siblings, family, friends, place where he lives, etc.) and **life experiences**; which are individualized for the moment, place, context and emotions experienced during the event; that likewise, they have a component of uniqueness that makes them unrepeatable at some other point in the storyline.

In this sense, it is clear that this cognitive law, like all the natural scientific laws, have limitations, but that these exceptions to the rule are not inconsistencies that demerit its category of law, but obey to a natural non-absolutist behavior in all laws. In such a way, that the limitation of this principle would be the psychopathological states that directly affect the mental identity of a person; as they may be: multiple identity disorder, Alzheimer's, senile dementia, trauma amnesia, etc.

2. The directed thinking principle

"Starting from the idea that the polygraph evaluation is a" controlled "scientific experiment, and that it is necessary, as far as possible, that the examinee can mentally discern between the specific concepts (memories) object of evaluation and discard those that are not, the possibility of this can only increase, when the cognitive process of directed thought is technically used "

As it has been explained, the *focus of attention* is usually placed on external stimuli (objects that manifest themselves in external reality) and psychological events (cognitive products of remembering, imagining, absorbing, etc.) which, under natural conditions, move freely, spontaneous and without restrictions, motivated only by subjective aspects and without the intervention of a counselor (Monge, 2016). Such is the case, that this mental behavior is governed by a cognitive Law called, **Free Association**[10]; It is defined as a process, function or cognitive activity by which the mind of a person brings thoughts (cognitive units = images, symbols, concepts, belief rules or mathematics) into his consciousness in a free, spontaneous and unfiltered way, all from the simple and vague presentation of a stimulus; that is, without prior induction, guidance or suggestion. However, this free flow of thoughts is strongly conditioned by the accumulation of rote information from past experiences, data that has been acquired through some learning model (Chavarría, 1985; Reale, Antíseri, 2010; Bezanilla, Miranda, 2014; Vives 2006; Monge 2016). This stimulus can take the form of a question, comment, word, image, aroma, etc.

It is worth mentioning that the Swiss psychologist, biologist, and epistemologist, Jean Piaget, called this cognitive effect as **Assimilation**, which he defined as "the tendency to understand new information in terms of existing mental structures." (Baron, 1997, G- 2)

For his part, Laplanche (1996), cited by Bezanilla and Miranda (2014, p.189), mentions that free association is the "method of expressing without discrimination all the thoughts that come to mind ..." "In psychoanalysis, is considered a procedure in which the patient spontaneously reports all thoughts to the therapist. "(Baron, 1997, G-2)

Similarly, the **stimulus generalization theory** cited by Honing & Urcuioli (1981) & Pearce (1986), explains that "it is the tendency for stimuli similar to the conditioned stimulus to provoke similar conditioned responses." (Baron, 1997, p.151). In a reductionist sense, this means that everything that sounds, looks, feels or smells the same or similar to a previous significant experience, will generate a cognitive, physiological and behavioral response similar to the first exposure of the stigmatized event. As an example, Baron (1997) illustrates with the following scenario: suppose that a girl has suffered several painful experiences from wasp stings, which has generated a strong conditioned fear, so every time you listen to other insects flying - like flies – it will possibly generate similar responses.

Derived from the above, the importance of emphasizing that the methods used for the *test questions introduction* implicitly pursue the objective of **constructing clear conceptualizations** amongst the interlocutors immersed in the interview phase (examiner and examinee); which is only achieved through an effective communication channel, conditioning, and suggestion. In such a way, that an examination question will be valid, only when the concept of the examinee fits in the definition of the evaluator or institution. (Shurany & Gordon, 2016)

Therefore, the free flow of thoughts is a cognitive behavior that comes to constitute an antagonistic factor that makes difficult to evaluate the literality of the subject of a test question; However, this cognitive rule, like other natural laws, operates to certain limits with the compensatory effect of another cognitive law.

Before this, Chavarría (1985), defines that the cognitive activities (mental action through which thoughts are structured) are divided in a general way into two classes: **undirected** and **directed**. Undirected cognition refers to the free flow of thoughts without being subject to control. And the directed cognition refers to thoughts that are generated from a raised

[10] The first studies on the discovery of this natural behavior of cognitive activity arise in the clinical psychology, in the therapeutic, on the design of verbal projective tests called "word-association test" or " free association test". Its main exponents were: Francis Galton (1879), S. Freud (1901, 1904), Wilhelm Wundt and Carl Gustav Jung (1904, 1910). The latter initiated the application of these tests as a "lie detector"; subject to which extensive laboratory and field studies were devoted. (Mas, 2010, pp.135-139; Anastasi & Urbina, 1998, pp. 425-428; Vives, 2005, pp. 31-35)

problem or instruction, as much by the same person, as by an external person.

This means that, in response to the demand of a task (operational and/or cognitive), a person's thoughts can be directed in a controlled manner through the induction, guidance or instruction of another person acting as a *counselor*. For this reason, the diagnostic methodology of lying in the polygraph technique, specifically in its **pre-test interview** phase, is aided by this cognitive modality to *increase the possibility that the stimulus is linked to a particular memory* that is part of the concept that integrates the relevant and comparative questions object of evaluation. Therefore, to avoid that free thought predominates in the test subject, where there is the probability that the examinee evokes episodic memories different from the concept of the examination question (due to the principle of free association), the examiner applies a series of operations within of the procedures called *introduction of relevant questions* and introduction of comparative questions; which are based on the techniques of **effective communication, learning by classical conditioning and suggestion**.

The purpose of these techniques is to try -as far as possible- to clarify the understanding of the examination topics, in terms of definition, organization and exclusion of the hypothetical behaviors that are, and not, part of the content of the test questions. (Shurany & Gordon, 2016, Prado, 2010, Nelson, 2016, Monge, 2013)

However, it is important to make clear that although these protocols are implemented to diminish the dominant effect of the *free association principle*, there are people who continue to link experiential memories that are not subject to evaluation, with the semantic structure of the question, situation in which it is speculated, that are the cause of the emotional and cognitive load strongly associated to certain semantic components of the stimulus (Example: it reacts in the consumption of illicit substances and its experience corresponds to drug traffic). Consequently, the praxis suggests that it seems that people release psychological tension (or fail to manifest the outgoing reaction force to a specific question) through **suggestive actions**[11] (displacement, minimization, justification of an action) and performing **catharsis**[12] (expression of the experience that generates attention salience). These exceptions to the rule come to constitute the limits of operation of a scientific law, or also called, "strange variables"; factors responsible of producing unwanted results in scientific experiments, such as the case that is being considered, or the results of an inconclusive diagnosis.

As is to be inferred, the establishment of a test question is not an arbitrary practice

[11] Rojí & Cabestrero (2013), explain that the suggestion is a "process by which a person is driven to such mental state that uncritically assumes a sensation, an idea or an action." Rhue, Lynn & Kirsch (1993) mention that the term process refers to the suggestion as an act of involving a series of actions by someone. Usually, these actions consist in the enunciation of assertions or phrases, but they can be companied by gestural elements, variations in breathing, the tone of voice, the speed of words, etc. "(Rojí & Cabestrero, 2013, p. 149)

as it has been sold in television and sensationalist events, in such a way that to define and construct a test question there is a methodology that allows **increasing the possibility of decrease the dominant effect of the antagonistic principle of free association**.

As Professor Grubin illustrates, "The role of the examiner is, therefore, to try to situate the subject that is going to be examined in a psychological context that increases the possibilities that any excitement to specific questions can be considered as the result of lying responses." (Villamarín, 2014, p.33)

For the further clarification of the concepts of free and directed thinking, the following example is cited: Suppose for a moment that we are conducting a laboratory experiment to verify the existence of these cognitive behaviors; in which we asked the test subject A to walk two kilometers on the main boulevard, the busiest and most publicized in the city. During your walk your cognitive attention and your derived thoughts will surely be provoked freely, voluntarily and with all naturalness, attending to the stimuli that are more attractive. In such a way, that perhaps the subject will observe clothe announcement, way ahead a girl, latter one of his favorite vehicles, later the siren of an ambulance and finally a motorcyclist turned a bolide. In the second experiment, we ask subject B to perform the same walk, but with a transcendental difference, in which we *instruct* and *guide* the person to limit himself exclusively in paying attention to the number of advertisements related to food; so that your thoughts will flow, but now in a directed way-and surely with one or another distraction.

As we can see, in the first scenario, the cognitive activity flowed naturally and freely, in which after the perceptions of the various objects, spontaneous ideas were generated that the individual associated with previous experiences. In the second case, cognition is subjected to a controlled orientation from the assimilation of an instruction and establishment of guidelines, which allowed the emergence of the modality of **directed thinking**.

In sum, the directed thinking principle with the support of the adequate technical procedures of effective communication, conditioning and suggestion, applied systematically and methodically during the introduction of the test questions, allows to increase the possibility of situating and orienting the thinking of the test subject towards the conceptual framework of the examination questions; because thanks to this **procedural principle** we can have a higher probability that in the presence of differential salience in a target question, the examinee may be hiding a thought (experience) familiar to

12 Harré & Lamb (1986), cited by Páez Rovira and J. A. Adrián (1993, p.160), defines catharsis as the "liberation of tension and anguish when reviving and expressing an intense emotional experience". In other words, it is the release of an episodic memory that produces cognitive, physiological and affective changes. Its oral expression allows recovering a balance in these human fields.

the thematic content of it and not to another aspect without associative context logical.

3.The recognition memory principle
"It is generally expected that the experiential memory will not be evoked mentally if there is no association-familiarization between the external stimulus and the episodic information stored in the autobiographical memory."

The nature of this principle is cognitive and strongly involves autobiographical memory. It is characterized mainly by being a reflex and innate, spontaneous and unconditioned response of the mind when evoking episodic memories because they even arise autonomously without any will of the subject over them.

In cognitive psychology, it is part of the laws of memory "in general", and is also called: **Law of Assimilation**; which establishes that we "remember ideas insofar as they are associated with others that already exists in our minds, that are inserted in a structure already known" ... (Valdivia, C.)

This principle is intimately related to the postulate of mnesic-mental identity, because the identification or detection of an individual's mental identity (made up of personal information and life experiences) is determined by his or her **historical awareness**; that is, by the ability to realize and recognize as their own memories of actions or events lived in the past; which is part of the control of the origin of memories (of experience or imagination) and of the process of controlling reality (sensory, contextual and cognitive attributes) to validate that a memory is the producer of an experience. (Suengas, 2000, Manzanero & Álvarez, 2015, Johnson & Raye, 1981)

This ability to evoke and consciously perceive a **scene and retrospective sensation** (flashback) about an event experienced in the past, is only possible when the mind associates, assimilates or identifies the stimulus of a question (or of any other sensory nature) with the iconic experience information previously stored in the collection of the autobiographical memory. Contrario sensu, if the mind does not assimilate the item (test question) with some episodic information of the memory, the image memory will not be remembered, and therefore, the historical awareness allows to recognize that there is no experience or action in this regard.

In concrete terms, the thesis is that the subject who is considered true to a specific test topic does not generate cognitive memory load to perceive and process the test question, possibly dominating at that time some other mental function, as it is the imagination. On the contrary, in the mendacious individual, cognitive memory load develops when the stimulus is processed; that is, the presence of an iconic memory (or memories) is inferred as a result of some experience that is linked to the semantic structure of the question.

On the other hand, it is important to emphasize that the natural act of the mind to link a stimulus with an image content (event scenarios) is not a simplistic cognitive process, because, as explained in the previous principle, the **internal attentional focus** (on thoughts themselves) in natural conditions moves spontaneously and

without restrictions, which means plainly: "the first thing that comes to mind". So, to try to mitigate this effect of free movement of thought itself, which is governed by the cognitive law of **free association**, the polygraphist seeks through the techniques of **suggestion, conditioning and effective communication**, channeling the thoughts and memories of a subject within a *relevant concept* (study question) to be evaluated, in order to allow the mental effort (cognitive load) generated by mental work to direct attention and evoke memory (or memories), reflect a phasic physiological reaction that allows - by sequential repetition of this stimulus response - to give an opportunity to detect the specific lie of the target topic.

Finally, this organization effect of the worldview is possible through the control and use of the cognitive law of directed thinking, which takes on operational relevance within the phase of "introduction of test questions".

4. The potential difference principle

"On average, mendacity to the relevant questions generates greater salience reaction than comparative questions, and inversely, the veracity of the relevant questions show less reaction force than in the comparison questions."

First of all, in order to be able to grasp this postulate, we need to introduce the term "differential salience (potential)", deciphering in an orderly manner the words that make up this pristine and main concept in the polygraph detection of deceive.

According to the Royal Spanish Academy (2017), in general terms, Potential means "force or power of a certain order"; in Physics, it is understood as a magnitude or energy capable of performing a job (Hewitt, 1999), and in Neuroscience -specifically- it is a voltage impulse that travels through the axon capable of detonating the biochemical activation of a neuron, at which time it is said that a nerve has been "triggered" (Giancoli, 2006).

(In Spanish this concept is referred as "Potencial diferencial" which is translated as "Differential Potential", the correct terminology in english would be "Differential Salience")

In particular, all these definitions converge in a single significant essence, where the term "potential" refers to *some type of energy or force capable of producing a change, response or modification in some sector of reality*; hence, there are terms such as action potential, gravitational potential, evoked potentials, electromagnetic potential, potential of hydrogen, electrolytic potential or human potential; all, focused on the ability to generate a change or movement in reality from a limited type of fuel or energy.

In the field of polygraph (forensic psychophysiology), the term *potential* refers to the "energy, effort, excitement, consumption or physiological wear that triggers a specific organ or target tissue as a spontaneous and phasic response to the systemic processing of the stimulus, that is given by the neural and cognitive complex of the organism of the individual ". For its part, the term *differential*, simply means distinction, variation, difference, discrepancy or clear opposition between an object that is being compared with an-

other (Which in english would be known as Differential Relay).

Therefore, the principle of "differential potential" (Salience) is defined as the graphically visible and statistical distinction of the physiological reaction force generated differentially between the relevant (research) questions and the comparative questions (controls); that is, that the parameter that allows distinguishing between a truthful person and a mendacious one on a specific research topic, turns out to be the gain, magnitude or physiological intensity that biologically reflects the subject as a response to the systemic-nervous processing of the relevant stimulus and control.

This is supported by several scientific studies that have proven with empirical, field and laboratory evidence that the intensity of the physiological reactions to the relevant questions (research) and comparative questions, are based on deception and honesty to the questions where questions and evaluates a past behavior or fact (American Polygraph Association, 2011, Ansley, 1983, 1990, Abrams, 1973, 1977, 1989, Franz, 1988, National Research Council, 2003, Nelson and Handler, 2013; Technology Assessment, 1983, Podlesny and Raskin, 1978, Kircher and Raskin, 1988, Krapohl, 2013, Krapohl and McManus, 1999, Raskin, Honts and Kircher, 2014, Raskin, Kircher, Honts and Horowitz, 1988).

This means that the parameter or index to differentiate the mendacious and truthful examinee with respect to specific evaluation issues is ultimately determined by the difference in physiological energy or level of sympathetic excitement that the body of the examinee releases as a derived response of neurocognitive processing of relevant and comparative questions (Monge, 2016). Thus, "deceptive examinees generally exhibit greater magnitude of change in autonomous activity in response to relevant stimuli than to comparison stimuli, whereas truthful examinees will generally exhibit greater magnitude of change to comparison stimuli than to relevant stimuli" (Nelson, 2016)

Consequently, the previous reasoning leads us to inertially introduce the concept of "differential salience"; which, makes possible that the *differential potential* axiom is knowable in the light of reason.

Said psychological construct allows to resolve a potential of differential of veracity or mendacity on a target subject of evaluation, which is achieved through operationalization in an "inductive" way to determine which question, of the two compared (relevant vs. comparative), presents greater physiological gain. That is, in order to establish a differential salience between two stimuli, the responsive behavior of the compared stimuli must be analyzed and measured in a particular way; in such a way, that during the act of measuring the magnitude of the physiological response, the point or value is assigned -in an act of comparison by competition of attributes- to the item with greater graphic characteristics of sympathetic excitation.

In this regard, Krapohl, Handler & Sturm (2012) illustrate that this expression, ...

characterizes the positive correlation between the degrees of psychological significance and the intensity of the physiological response. The concept of differential prominence is based on the premise that reactions can reveal underlying processes, which can be exploited to detect deception or recognition under controlled and structured conditions. This does not restrict the operative mechanism to fear, but it assumes a common path for the physiological expression of cognitive and emotional processes, which give rise to psychological prominence. This is proposed as a replacement for the old hypothesis of the "Psychological Set". See: Handler & Nelson (2007); Handler, Shaw & Gougler (2010); Senter, Weatherman, Krapohl & Horvath (2010).

In this way, the differential salience determined during the data analysis, both by physiological channel and by questions, is carried out from the frame of reference of the observer (experimenter-examiner), estimating the psychological significance assigned by the subject to the stimuli, from the correlation with the level of physiological energy released as a response to the neurocognitive processing of the items, which manifests itself in an intermittent and phasic manner during the test graph. According to Handler & Nelson (2015), this variation in the physiological reaction potential is due to the emotional factor and the cognitive factor, guided by a learning process by classical conditioning during the construction of relevant and comparative concepts.

In sum, it can be deduced that the principle of differential potential is a function of the mental mechanism of differential salience that assigns the cognitive-emotional system of the examinee to the different test stimuli. This subjective state is estimated by the examiner from the correlation that exists with the **physiological reaction potential**; which, through its quantitative conversion, by means of a statistical-mathematical model of indirect measurement, it is possible to distinguish the distribution of the cognitive and emotional load that has given rise to the comparative and relevant stimuli; the asymmetric decanting of the accumulated values on any of the aforementioned binomial variables, allows the reputability, probabilistically, of the truth or mendacity with respect to the objective topic.

The previous reasoning leads us to argue that this neurocognitive law of polygraphic detection of deception is amalgamated by the axiomatization of three major theories, which, like Handler & Nelson (2015), the author shares.

Here is a brief notion of its most relevant aspects.

a) Theory of emotion

b) Theory of cognitive

c) Theory of classical conditioning

a) Emotional theory.
This theoretical artifact is composed of physiological, neurological and cognitive (psychological) thought currents, which are grouped at the end of the unhappy debate path to explain in a synergistic way the origin of nature, process, manifestation, and end of human emotions. In such a way, that Emotional Psychology not only studies the affective syndrome from the behavioral (psychological) and physi-

ological orientation, since it is clear that emotions are inherently influenced by cognitive processes; hence, that the positions that explain this phenomenon and that have greater acceptance and validity in the scientific community, are known as *Cognitive Theories of Emotion*; However, although it is known that these two variables (emotion-cognition) are interrelated in reality to conform the cognitive-emotional system, the academy chooses to teach them separately for a better understanding of the human mind.

In this same sense, the science of the scientific detection of lies (SCDoL), studies mendacity from theoretical models of Emotional Psychology and Cognitive Psychology; of which, three assumptions are derived that approximate us to the explanation of the question: Why and how is it possible to detect the lie in the human being?

With regard to the **emotional theory of the detection** of deception, which is the one that occupies us in this section, the following is highlighted:

- The detectability of signs and symptoms of emotional tension (attitudinal, physiological and cognitive), underlying contexts, increases when certain psychosocial factors are added. In this regard, he points out that when the mendacious subject has a **motivation** that moves him voluntarily to hide a thought to obtain a reward for the success of the deception or some punishment in case of failure, he tends to experience greater psychological tension; that is, the existence of a sufficient cause that motivates his interest to succeed in convincing his interlocutor, and therefore, appear credible in front of him, makes a significant difference for the probabilistic detection of deception. (DePaulo, 2015, Hartwig and Bond, 2014, Martínez, 2014)

- Another factor is the **environmental context** in which the act of mendacity is released; such as: lying face to face, situations of high risk (ending in prison, loss of employment, impairment of the social image, etc.), quality of the interrogator or receiver (police vs classmate), presence of evidence, in others. Also, the **lie content** is one more element that is linked to the falsified theme, so it is not the same to deceive about the sneaky date with your suitor than to lie about your participation in a homicide. (DePaulo, 2015, Hartwig and Bond, 2014, Martínez, 2014)

- On the other hand, the **lie type** that a mendacious subject uses in its message is added to the conditions that increase the emotional and cognitive tension in the subject; which means that executing a narrative lie vs. a dichotomous lie generates a greater burden on the cognitive-emotional system (Hartwig & Bond, 2014, DePaulo, 2015, Monge, 2016); hence, experts recommend using models of cognitive interview to uncover or elicit valid deception keys.

- It is postulated that the act of lying

is not accompanied by a distinctive emotion, as it was traditionally believed to be fear (to be discovered or consequences) or guilt, because being this a complex emotional state is influenced by a **combination of emotions** that are very possibly of negative valence (Blandón, López, Masip & Fenn, 2017, Martínez, 2014, Monge, 2016, Khan, Nelson & Handler, 2009); hence, its detectability by means of behavioral signals turns out to be slightly higher than chance, with almost 70% accuracy (Hartwig & Bond, 2014). This is because there are no specific and universal behavioral signals for this, or any other compound emotion (Martínez, 2014). Quality that distinguishes basic or primary emotions. (Redorta, Obiols, and Bisquerra, 2006, Martínez-Pecino et al., 2014)

However, although different conditions come together during the emotional syndrome of lying, there are emotions that dominate during that moment; situation that leads us to think that the traditional hypothesis of fear of consequences and to be discovered, is not so far from reality, and specifically, by research issues where the situation at stake is high risk to the examinee. The reason why the operating mechanism of fear during the detection of the lie should not be restricted or totally excluded. (Krapohl, Handler and Sturm, 2012)

Given this scenario, there is the possibility of palpating one of the causes responsible for the false diagnoses (negative and positive); it leads us to recall on how many occasions the famous graphic rooms are without significant reactions (positive scores), after the evaluated commented non-critical experiences that had not been provided in the interview (situation in which a technical detection precedes); where, for example, the detection of lies in the drug use issue turns out to be linked to an experience where his father is the victim of an addiction, or in his case, a technical detection in the question of commission of crimes, when the examinee was victim in his childhood of an act of sexual violence.

In short, the scenarios outlined above (which are cases of reality) allow us to deduce that behind the diagnoses of truthfulness or deception, any intense emotion (positive or negative) that provokes a differential salience can be involved in both the relevant questions as comparative, where shame, anger, anxiety, disgust, frustration, resentment, grief, impotence or repentance, could have a main partition, in confluence with fear and guilt.

- In the same line of ideas, when the test questions act as conditioned stimuli and they are processed neurocognitively, they give rise to an **associative emotional reaction**; wherein said elicited affective state, brings with it a negative (or probably also positive) emotional valence label given subjectively during the experience and evalua-

tion of the original event.

This situation is added to the possible causes that generate false diagnoses because the graphic and phonetic images (words) that make up the stimulus questions are possibly so deeply rooted affectively to a past event that brings with it an associated emotional state.

- The lie, like any other human behavior, is naturally accompanied by emotions, a situation that leads us to suggest that this complex emotional state is located under a principle universally recognized by Psychology and Neurosciences, which hold that all human emotion is accompanied by **three components: a neurophysiological component, a cognitive component** (*includes awareness of the feeling or affection = subjective experience*) and **behavioral component**. (Baron, 1997, Sperling, 1966, Sanjuán, 2013, Alonso, 2007, Pasantes, 2003, Vásquez, 2016, Vila, 1996, Vigotsky, 2004, Garrido, 2009, Aguado, 2005 & Fernández, García, Jiménez, Martín, & Domínguez, 2013). Therefore, said planes of manifestation make it feasible to affirm that lying is a non-observational phenomenon that can be measured by indirect methods or correlational indicators and therefore, probabilistically detectable.

- The level of activation of the planes of manifestation of the emotions and specifically, of the lie, suggest to be under **the load or emotional overload** that the subject acutely manifests during the act of lying; This is possibly due to the number of emotions involved, the intensity and negative valence of the affective states that the subject perceives during the act of trying to hide a thought and the cognitive work that he performs to appear credible. In this sense, the factors that are added to trigger this cognitive-emotional state are the element of confrontation and the punitive element (consequences).

  The foregoing means that the difference in the physiological reaction potential between one question and another (relevant vs. control), is in virtue of the aforementioned affective qualities that the subject relives during the act of lying; then we must make clear that the lie - both in laboratory and natural contexts - can only exist when it is provoked; that is to say, that in the popular idea of "lying to oneself", it would be a failed act.

- The affective state differs from a person who lies to the one who speaks truthfully, because mendaciousness experiences certain negative and intense emotions that arise through social conditioning, where the individual has been taught since childhood that lying is a reprehensible behavior (moral and religiously) and that its confirmation implies a consequence, in turn, that its manifestation is revealed by the signs of nervousness and guilt. (Blandón, López, Masip & Fenn, 2017)

b) Cognitive theory:

- The **cognitive theory of deception** suggests that the effort or cognitive weariness is usually greater in a brain that executes a lie than the one that sheds the experienced truth. In other words, the mendacious subject is cognitively engaged in a mental, behavioral, and emotional effort to appear sincere; situation that translates into a cognitive overload.

  It warns that one of the possible cognitive components that have greater involvement in the act of lying is the episodic and semantic memory. Mental entities that are in constant conflict in the consciousness of the mendacious subject, who tries to inhibit the first and trying not to lose the logical thread that leads to deception.

c) Theory of classical conditioning:

- A theoretical model that proposes that it is possible to introduce learning in a test subject through a controlled context, where certain specific stimuli are exposed consistently over a period of time on the neurocognitive system of the examinee, allowing to generate responses in a specific way and oriented towards the appearance of the said stimulating event. This means that classical conditioning, in combination with effective communication, facilitates the individual, where, how and when to react.

Concluding this section, we can say that the fluctuations in physiological responsiveness are strongly conditioned by the cognitive and emotional load present in each stimulus. Factors that are decisive for resolving the differential relay.

5. Principle of statistical significance.

"At a higher frequency of salient physiological reactions, in one of two compared stimuli (control vs relevant), in three situations and at different moments of series and with a minimum of three records each; lower is the probability that it is the product of chance and greater its significance of mendacity. "

In the first place, to avoid confusion, we must clarify that ***statistical significance or statistical significance** are used in an indiscriminate way in the Statistics literature; however, we must limit the term "significant" (meaning or significance) to understand this principle, which apparently seems to be associated only with scientific laboratory issues, a situation that in the field of natural or ordinary logic is not so foreign. We'll see later.

*(In this paragraph the author is pointing at a very important issue that happens often with spanish words. In english the word "significance" may be used for both purposes, as described below, it could mean something "important" but, statistically speaking, it means that is unlikely that something happens by mere randomness. Usually, in spanish the words used indiscriminately are "significación" and "significancia" which have to different meanings, but by translating it in english this word becomes a homonym).

Bellón (2008) comments: "The term" significant "usually generates confusion and

not many researchers understand it well. In general, when we speak of something "significant", it implies that it is important or prominent. However, in statistical terminology, a "significant result" means highly unlikely, but does not necessarily have to be "important". Ramalle and Bermejo (1996), clarify that "many times, due to ignorance or mental laziness, we usually use both terms as equivalent. Despite the many warnings of statisticians ... about the importance of differentiating both concepts, there is still some confusion. It is easy to give examples where we can see how statistically significant does not necessarily mean important or relevant. Significance indicates an association or difference between variables that can hardly be explained by chance ... (pp. 863-865).

Gento and Gunter (2012), point out that "Significance refers to the degree of representativeness of the obtained data ... in a sample drawn from a specific population" (page 134). This refers to the fact that this data set can represent significance (unlikely that we obtain a random result) for the confirmation of the hypothesis. However, the statistical significance is not indicative of the magnitude of the difference or strength of the relationship with the hypothesis. It only talks about the probability of obtaining the same result in another test, carried out in similar experimental conditions; which would confirm that the statisticians' tendency was more than good luck. (Vilalta, 2016).

This postulate and mathematical theory is used in practice by the rest of the experimental sciences in order to test the objectivity of their hypotheses (confirm or falsify), from a set of experimental trials to observe their holistic behavior. Therefore, it is applied to field and laboratory investigations, in tasks focused on doing science or applying science.

With regard to the advancement of science, it helps to establish the universality of the hypothesis to raise it to the level of scientific law. For its part, in the field where science is applied to technical problems, and even in our everyday life, this concept allows us to, and facilitates decision making by intellectualizing the meaning that gives us the frequency of appearance of the measured effect. Thus, it is said that the results of a series of tests to test a hypothesis (in its two aspects of approach: null hypothesis and alternative hypothesis) are "statistically significant" when it is reduced the possibility that they were the result of an accidental, accidental, occasional or random event; in this way, the assumption would be that the data generated were produced by the experimental treatment of the independent variable (supposed causes of the effect caused in the dependent variable); that is, there is a true correlation or association between the variables provided in the hypothesis. (Moncada, 2005; Moya, 2002 & Martin, 2008).

Insisting on the subject, Fontes et al. (2015) explain that a result is called **statistically significant** when it is not likely that it was due to chance. A "statistically significant difference" only means that there is statistical evidence that there is a difference between the variables studied. It does not mean that the difference is large, important, or significant in the strict sense of the word.

Therefore, when using the expression:

"there is statistical significance in the results obtained", it is to affirm that **there is a difference between the amount of data collected** between two samples to which it was applied and not the experimental treatment (supposed cause of the effect) ; said differential asymmetry of the data (obtained statistically by means of statistics and test) suggests that the finding has an intelligent meaning that gives a positive or negative response to the research hypothesis and where the probability that the result or effect has been generated by accident is diminished or mere chance; which is derived and based on a premise: **frequency or recurrence tendency with which the effect measured in the different trials was replicated.**

As we can see, the central formula of the term "statistical significance" is the **consistency** or **frequency** with which the phenomenon that is measuring is measured in the different tests included in two groups of samples (one to which the experimental treatment is applied and another control); in the end, quantified differences will reflect a meaning of association or discrepancy; that is to say, that there is or not, a correlation between the variables of the hypothesis. A situation that is made in representative and considerable samples because one, two or three events would not mean anything; so, it is necessary to look for the recurrence of the phenomenon to confirm its existence in reality.

So far, we have qualitatively analyzed the concept of significance in the field of statistics, however, this postulate also has a numerical conversion - common in the factual sciences - which consists of applying the so-called "tests, techniques or tests of statistical significance" ; nevertheless, this topic will be the subject of another dissertation, since the relevance of this postulate is to see how the frequency factor with which a phenomenon manifests is so influential and powerful for the action of **decision making**, determination of conclusions and **assumption of risks.**

This effect of consistencies, not only influences the task of confirmation of hypotheses for science but also has a strong intervention in everyday life. And for this, it is enough to contemplate the following daily scenario:

Imagine, that for several months we have taken the "A" route to get to our new job, in which we have registered an average time of 45 minutes on the road; However, on one of those occasions, we mistakenly walked on "route B", in which surprisingly the time elapsed turned out to be 26 minutes, a situation from which we could deduce that it was simply luck and that it was probably due to the little traffic or time; however, we decided to take that alternative the following day obtaining the same result; situation that leads us to prolong this decision for five more days (motivated by curiosity). In the end, the strangeness was that the time of 26 minutes was more-less consistent. Therefore, in the face of such a favorable recurrence in times on different days, the reason tells us that the result of taking that route means something more than a mere chance.

Other similes related to scientific topics would be the following:

Derived from several earthquakes in the

Mexican Republic in July 2017, a seismologist explained in a newscast that the events were due to the abrupt movement of the so-called "fire belt"; when the drivers of the program questioned him about this concept, the expert explained that it was a large tectonic plate that circumscribed the Pacific Ocean coasts and that the particular denomination was attributed to the great unusual seismic activity that can arise at any time. Given this statement, an auditor asked how this fire belt had been detected, so the professional explained that a statistical study of earthquakes in this area during the last hundred years was conducted. A situation that led seismologists to understand that the frequency or consistency with which these phenomena were presented at different times, allowed us to deduce that this grouping of ordered data had an intelligible meaning, which, later, was translated as the finding of a large Tectonic plate that accumulated tension, called "fire belt". The statistical study of the replication of these phenomena around this area, allowed to intellectualize that these data were not grouped by chance or simple coincidence, but that below them there was a clear cause.

In another context, the principle of statistical significance is also used implicitly in the judging activity of the judge during the administration of justice in the face of a criminal act. For this, the judge has to gather evidence confirmed and experienced by his panel of forensic experts, who provide objective and subjective data belonging to different expert techniques, where the administration of these and the link directed towards the person tried, could determine by majorities, the high probability of involvement in the criminal event. This means that no indicted evidence would be sufficient proof to determine the guilt of a person - even the DNA test, only the concatenated set of data would mean that they did not coincide, but that it has a sufficient cause.

Up to this point it is clear that when the **reproducibility** (also called replicability) of the results or the assumed effect of the hypothesis occurs under similar conditions and at different times, and even by different researchers and places, it allows the researcher's reason to conclude that the statistical finding has a conceptual content and it is unlikely that the phenomenon is a product of chance.

This condition was made clear by Socrates himself in his dialogue with Theaetetus, writings of Plato, which states powerfully that "Science does not reside in the sensations but in the reasoning on the sensations, since, apparently, only by reasoning science and truth can be discovered, and it is impossible to achieve it in another direction ". (Ambriz, 2006, p.36)

In the same way, Albert Einstein in his life work to discover the fancy rules of the universe, in a letter written to Max Born, "the Friend and physicist with whom I would discuss this issue over more than three decades:" the mechanics Quantum is certainly impressive, "Einstein would say. But an inner voice tells me that this is not real yet. The theory says a lot, but it does not really bring us closer to the secrets of the Old Man. Be that as it may, I am convinced that **God does not play dice**. " (Walter, 2017, § 14. 5)

This simple - but extremely profound - expression was not Einstein's egomaniac eloquence, but "it was a principle that Einstein raised (as he did in the case of relativity) to the category of postulate

that guided him in his work ... When he plated this matter, there was a possibility of not believing that the good God had created beautiful and subtle rules that determined most of what was happening in the universe, while leaving a few things completely at random. That idea seemed like an error. "(Walter, 2017, § 14. 5)

This is how Einstein's reason led him to cling to the current of causality and totally renounce questions of faith or chance; since knowing how many variables interact subtly, orderly, systematically and naturally in a universe duly administered in elegant laws or regular rules that govern it, it is naive to think that all this natural logistics was the product of chance, or the privilege of chance.

This allows us to consolidate the reality of the postulate of *statistical significance*, given that as an effect of the reality of consistently manifested in time (at different times) the reason allows us to deduce that there is a sufficient cause that causes this consistent pattern, and which in turn harbors an intelligent meaning, which can only be reached at a cognizable level by the statistics of the manifested data and not by an isolated sensitive experience.

In particular, this postulate is a natural law that governs the very reason of man to arrive at decision-making and draw conclusions, both in everyday contexts, and in the strictness of scientific work itself. In this last, it is worth mentioning that this statistical law is applicable both to the polygraph and to the rest of the empirical sciences, which use it to universalize hypotheses or to apply the hypothetical-deductive method to solve specific cases.

Up to this point, surely the reader will ask himself when to apply this axiom in the methodology of the polygraph and how it intervenes in the process of diagnosing lying. Given this, we should make it clear that although lying is a behavioral phenomenon with neuro-psychophysiological implications dependent on psychosocial triggers (both for its manifestation and for its intensity of biological expression), the technical task of identifying this phenomenon is not sensitive -for its subjective nature- is limited to not being performed by a direct measurement, so its detection implies a type of statistical study based on correlational measurements (indirect measurement) on "proxy data" (indirect sources = physiological indices) that allow us to approximate probabilistically to the existence of the cognitive-emotional state of mendacity. (Nelson, 2016).

Therefore, the feasibility of objectively identifying the presence of this phenomenon, lies *essentially* in the application of *descriptive statistics*, based on the observation of the behavior of the **distribution and frequency of the numerals** (symbols with numerical value), positive (+) and negative (-) that are assigned to the most salient physiological reactions (greater physiological reaction force) during the data *analysis phase*; this, depending on whether they belong to the control (+) questions, or the research questions (-).

In other words, the diagnosis consists of a **biostatistical analysis** of the frequency with which the values (+ / -) are presented that are assigned to the reactions of the questions that have greater physiological gain; in such a way, that it is a comparison procedure on the magnitude of reaction between two stimuli (questions) of the test (controls and research); in which at the end of the **conversion** or **numerical**

transformation of the sensitive data, the diagnostic decision of truth or mendacity is discerned based on the accumulation of salient physiological reactions in one of two compared stimuli. That is, the detection is subject to a **process of a competition of values** (+ or -) based on the law of the signs of based on the **law of the signs of algebra**, where the essence of the study lies in a **diagnosis by majorities**.

In such a way, it would be anti-scientific to determine the mendacity of a person with only an isolated reaction in a question, so it is necessary to collect a series of physiological samples distributed in three graphs, varying the comparison position of the research question, versus control question, to confirm that the effect of the reaction intensity is not due to a fortuitous event.

Finally, it is worth mentioning that the overall influence of this axiom in the polygraphic diagnosis is independent of the type of rating scale and cut-off point to which the technique applied is applicable

Discussion

For decades, the polygraph examiners and people (victims, witnesses, victimizers, etc.) who have verified the effectiveness of the technique, are certain that the detection of lies through their methodology is a reality in the light of reason and of empirical evidence; Of course, like any technique that the experimental scientific method occupies - which are not exact - its results are probabilistic, with margins of error and confidence intervals; However, the major problem does not lie in this, but begins when the technicians try to defend the validity of the conclusive diagnostic result, and specifically, on the scientific basis where their technical and technological engineering are based.

As a milestone in the history of the discipline, in 2011, the American Polygraph Association published a meta-analytic study[13] focused on the subject of the accuracy of the polygraphic technique; whose objective was beyond eliminating the use of non-standardized, validated or experimental techniques, since it implicitly allowed to demonstrate to the scientific community that the detection of lies with the use of the polygraph technique is a real and possible fact. However, although the problem of accuracy could be said to have been overcome, now it remains to be based on what natural constants or scientific laws we are entrusting this di-

[13] Thirty-eight studies met the qualitative and quantitative requirements for inclusion in the meta-analysis. These studies included 32 different samples and described the results of 45 different experiments and surveys. These studies included 295 evaluators who provided 11,737 results from **3,723 exams**, including 6,109 scores from **2,015 confirmed misleading exams**, 5,628 scores from **1,708 verified true exams**. Some of the cases were scored by multiple scores and using multiple ADT methods ... Excluding the atypical results, the comparison question techniques aimed at specific **diagnostic tests** of events (a single emission), in which the variances of Criterion of multiple relevant questions are not independent, it produced an aggregate decision accuracy rate of **.890** (.829 - .951), with a non-conclusive combined rate of **.110** (.047 - .173). The PDD techniques designed to be interpreted with the assumption of independence of the criterion variance of multiple relevant questions (**multiple-problem** and **faceted**) produced an aggregate decision accuracy rate of .850 (.773 - .926) with a combined non-conclusive rate of **.125** (.068 - .183). The combination of all validated PDD techniques, excluding atypical results, produced a decision precision of .869 (.798 - .940) with an inconclusive rate of .128 (.068 - .187). (APA, 2011)

agnostic discovery.

In the same sense, in 2003 the National Academy of Sciences of the United States of America, in its document, "The polygraph and the detection of lies", visualized this knowledge gap within its theoretical structure, because in very reductive terms it ruled that its theoretical basis is quite weak and that there is ignorance about the processes underlying the polygraph responses.

Given this, it is elementary to point out that all factual science reaches scientific rigor only in terms of three main axes: with statistics, **experimental methodology and philosophy of science** (McGuigan, 1983); This position leads us to deduce that this discipline has focused strongly on strengthening the first two axes, and has paid little attention, or reduced importance, to its philosophical component. A chapter where lies the nomological answer (scientific laws) that constitutes the most ulterior support that explains the reason for the empirical finding of the detection of lies with the use of polygraphic engineering.

In view of this panorama, the present Epistemological study intends to give a radical answer and foundation to this problem that is strongly suffered worldwide in the field of polygraph; in which the theoretical evidence indicates that the disciplinary body of polygraphic theory, currently available, lacks the enunciation of "**Scientific Laws**" that describe the regularity of the behavior of its phenomenon of study (the lie detection) on which its engineering diagnostic treats. This assertion was derived from a deep comparative epistemological analysis, between the components of **scientific justification** science in particular -which establishes the theory of science-, with the current theory of polygraph, where it was found that it lacks explicitly this pristine foundation and in general, of a **Philosophy of Science** (Monge, 2011); same, that turns out to be a fundamental part of the curriculum of every scientific discipline, because in this section lie the most basic first foundations of a specialty.

In such a way, that said statement acquires such relevance, because the Epistemology or Philosophy of science, maintains that this basic and imperative component serves as a theoretical substructure that provides foundation, confidence, logical sense and validity to the rest of the derived knowledge (speculative and applications) of a particular doctrine. In other words, the diagnoses, explanations, descriptions, forecasts, arguments, results, methods and even technology are supported and made up of these empirical natural constants.

In this sense, Monge (2011), reported that the discipline had the absence of a theoretical structure properly "systematized" and that it was necessary and imperative to start its engineering, because this quality, says Cegarra (2012), is epistemologically one of several characters that distinguish the true science from pseudoscience.

According to this, several researchers and critics of the subject have agreed that the current state of polygraph appears to be "atheoretical" (Monge, 2011, Krapohl, 2015, Palmatier & Rovnerc, 2015), as compared to other scientific disciplines. doctrine has a limited epistemological framework with basic and introductory concepts that every scientific

subject possesses; as they are: the material and formal object of study, purpose, theoretical division, specific tasks, scientific method, and special methodology; In addition, the situation that motivated the design of this research was that this specialty did not have the express enunciation of Scientific Laws within its theoretical framework, which would describe the natural constant that governs the effect of the detection of lies by means of its applied knowledge system.

In the same order of ideas, Krapohl (2015) tells us that the stigma of "atheoretical" that pursues polygraphy, is because their research and practice are not based on a theoretical framework, but they have raised attempts at theories that have tried to elucidate the processes that lie behind the detection of lies; however, these explanatory perspectives, which in reality are hypotheses - and not theories in the strict sense -, have not been able to axiomatize to the extent that they can consolidate a kind of "**unified field theory**", because each of them deals with Individual positions (not systemic) the possible causes of this diagnostic effect.

In this regard, Raskin and Barland, in 1973, summarized five theories that explain from different positions how the detection of deception works with the use of the methodology of polygraphy; However, currently only four of them have come to be placed on the debate table, without completely constituting a "theory" (Krapohl, 2015), because they are presented as independent thinking guidelines, without being integrated into synergy. to explain in an integral way the diagnostic effect of lying. In addition, these approaches present a series of explanatory nuances in which some focus on a single aspect, others take a different perspective, one more seems to be a combination of both.

Specifically, these theoretical perspectives that we will explain briefly below, turn out to be unilateral, with a vertical vision, in which at the end of the discussion they fail to integrate their successes; likewise, its bordering ideological perspectives fail to substantiate and explain the reason for each of the phases of the procedure and the diagnostic effect that this produces. Nevertheless, they agree to rescue that these assumptions were the incipient inspiration of the first principles that today are postulated in this study.

We will see then, that the construct of the **Psychological Set** of Cleve Backster (Matte & Grove, 2001), alludes that in the determination of the veracity or mendacity of a person, with respect to a relevant subject of evaluation, it will be determined by the "selectivity" in which your attention and sense organs are tuned to a specific stimulus (or types of stimuli); because according to the theory, it can be both relevant questions (for deception), or comparative (for truthfulness), although it also suggests that this distinction and discrimination can occur both in symptomatic questions, and in relevant sacrificial questions. However, as we can see, the psychological set has a basic focus on selective attention, a psychobiological condition that is not applicable to reality, since studies indicate that cognitive attention in a polygraph exam, where items are exposed intermittently and consecutive, it does not focus on a particular stimulus, but rather, attends to each of the stimuli that comprise the test format, through the modulation of an alternating and sustained attentional mechanism

(Monge, 2016).

On the other hand, the hypothesis, **Relevant Issue Gravity (RIG)** of Dr. Avital Ginton (2009), proposes that the attraction of the attention of the examinee to the relvant questions, is in virtue of the semantic and conceptual qualities of this stimulus, which have the property of attracting the attention of the guilty party, dissociating attention from comparative issues that are not significant to him; since, the greater the concern of the subject to the research topics, the greater the attention capture to these items. As a consequence, the innocent examinee, having no associative link with the content of the relevant question, finds it easier to detach himself from the investigation issue in order to turn his attention to comparative issues.

As we can see, this explanation turns out to be very limited to the attention mechanisms that really dominate during a polygraph examination, because it reveals that the traditional attentive selectivity (as well as the *psychological set theory*) is the one that takes control of the determination of a truthful and mendacious person; situation that currently the neurosciences have explained to us that it is a false attentive state during the polygraph intestine. For this reason, we can deduce that this explanatory orientation does not satisfy the complexity of the cognitive-emotional factors that influence the diagnostic decantation.

One year after the application of the GRI approach, a new orientation emerged called **Differential Salience (DS)**, a hypothetical position that arises against the "selective" approaches of SP and GAR, with which it seems that polygraph begins to see the light (Senter, Weatherman, Krapohl & Horvath, 2010); as the construct elucidates that there is no attentional, or organoleptic, "selection" for one or another type of stimulus in the test examination, because the evidence suggests that the **physiological responsive effect** is present on a regular basis in each and every one of the stimuli, and not as a selective operating mechanism as proposed by the previous notions. Therefore, the phenomenon of Differential Salience can be defined as a mental mechanism (usually not conscious) in which the person's cognitive-emotional system attends and assigns different degrees and nuances of **psychological significance** [14] to the stimuli exposed in the environment (controlled or natural), with the aim of exploring and evaluating the surrounding environment to ensure survival and adaptation. These variations in the mental prominence deployed to environmental stimuli, facilitates the subject making decisions to identify for example risks or deploy a course of action relevant to the demands of the environment or

[14] Psychological significance can be understood as the result of the perceptual process by which a meaning, value or logical sense is assigned to the stimulating sensations perceived in the environment. These labels with which the stimuli are qualified, arise from previous experience, or, absence of them, with which the conscious impressions of the physical reality of the environment are formed, allowing to establish mental models (also called filters, maps or mental set) that come to have a conditioned effect on the person that determines to a large extent what is thought and felt about the objects, people or events; so much so, that the psychological meaning of stimulating events usually have a logical component (such as threatening, important, novel, surprising, unexpected, familiar, complicated) and affective (emotion).

tasks entrusted. Thus, in an ecological environment, the mind performs a kind of panoramic evaluation mechanism on the radius of interaction and domain to establish differential salience on the different stimuli present around it, and thus be able to prioritize the attentive needs.

However, in the laboratory conditions in which the polygraphic examination is carried out, the behavior of the mind when performing differential salience (variation in psychological significance) on the different items, is provoked in an intelligent and controlled manner, and not spontaneous as in the center of nature; so much so, that the stimuli are exposed intermittently and for a short period of time, since during these windows of external and internal attention (stimulus-response-memory) the examinee evaluates and cognitively recognizes the graphic and phonetic image of the question to link it (or not) to an image memory and thus, simultaneously assign a logical and affective meaning (subjective experience and aware of the emotion) that seems to differentiate from stimulus to stimulus during the sequence of the graph.

This distribution and concentration of the mental energy can be reflected in the level of the physiological effort of the phasic responses coming from the stimulus questions; for there is evidence, within the "limits of normality," that the degree of differential salience exercised by the mind over the test questions is a cognitive process intensely related to the physiological reaction force. (Krapohl, Handler & Sturm, 2012; Senter, Weatherman, Krapohl & Horvath, 2010)

In this way, the prominence in physiological responsivity is the parameter to establish probabilistically which subject of evaluation (comparative or relevant) is more significant to the examinee, allowing to estimate in the last instance, his state of mendacity or veracity regarding the target topic.

Therefore, as can be seen intelligibly, the concept of SD is not only dominated by the emotional factor, but also by a complex of neurocognitive processes (sensation, perception, attention and memory) and learning by conditioning that underlies these variations of responsive; therefore, it is necessary that this construct be expanded and incorporated into a solid neuroscientific theory, which until now seems to be that the **Preliminary Process Theory (PPT)** of Dr. Robert Barry promises to consolidate a *neuro-psychophysiological model of polygraph* that explains systemically the phenomena that are behind the "black box" process of the psychophysiological detection of deception.

In this sense, Palmatier and Rovner (2015) have promoted the incorporation of this theoretical system to polygraph, which is originated in the Clinical Psychophysiology and was strongly influenced by the contributions of Dr. Barry (1996), who initially developed this explanans to describe the neurocognitive processes prior to the emergence of the *oriented response*, based on the study of phasic physiological reactions; which is similar to the effect produced in the test subject when he is exposed to the stimuli in an oriented, specific and controlled manner; because of the neurological, cognitive and emotional processes in these psychological contexts seem to share the same biological circuit. So, that, if there

is a theory of preliminary processes to the orientation response, highly explored and accepted by the neuroscientific community, it is possible in the near future to take as its axis this theoretical design to consolidate a **theory of the preliminary processes to the psychophysiological detection of deceive.**

As a conclusion to the previous perspectives, the only one that strictly complies with the scope of a true "theory", is precisely the TPP, because even though the SP, GAR, and SD are presented in diverse polygraphic dissertations with the degree of theory, in the epistemic taxonomy it is only "hypothesis"; it is important to remember that a theory "is a proposition that organically articulates diverse laws and concepts in order to explain and predict, as far as possible, certain phenomena that are presented in a plot of objective reality." (Rojas, 2002)

Coincidentally, Happel (2005) shares that the means to detect deception, including polygraph, require substantial conceptual advances in the science of deception, in particular, in the establishment of a "theoretical basis" upon which such a system should be based, emphasizing that "Neuroscience" and the fields related to it, can make significant contributions to the development of a **deception theory**.

In this way, the so-called TPP is the only one of the explanatory designs that is based on a set of concepts and "general scientific laws[15]" characteristic of **Cognitive Theory**, **Emotional Theory** and **Behavioral Theory**, which coincidentally turn out to be the same currents that Nowadays they are resorting to polygraph to elucidate the processes that influence the feasible detection of deception. Situation that leads us to think that this scaffolding seems to be the ideal to accept the scientific laws of polygraph (special laws) that in this research work are promulgated, because the nature of these postulates are cognitive, emotional, physiological, behavioral and statistical; they were not created, much less presented as a panacea, but rather, they were unveiled, made manifest in the eyes of reason, since they lay in an unspoken state in the mechanistic entrails of the methodological engineering of the technique, and of which more than one of them, had already been implicitly mentioned in various polygraph dissertations, but without actually visualizing them with the value and epistemological status they represent.

Other dissertations reviewed in the course of this research, considered as references in the topic of the *Scientific bases of poly-*

[15] The phenomena of study that originate and occupy the special sciences are governed by particular natural laws that govern - within the limits of normality - the behavior of that phenomenon, since from these regularities it is possible to predict, diagnose, explain or control similar entities; nevertheless, there are laws of nature that are even more general, because their influence on these special phenomena is indirect and determinant; hence, that scientific laws are conceived as a natural "system", as denoted in the following example: In medicine, the phenomenon of respiration is regulated fundamentally by universally verified neural structures (scientific laws), such as protrusion and the brainstem-spinal bulb; However, the physical laws of gases, such as the law of Boyle, Charles, Henri and Avogadro strongly influence the fulfillment of this vital process.

graph, showed that in their content they do not deal with the pristine foundations or the first scientific bases to which the neural theme of this thesis refers. for the most demanding critics of the polygraph, these studies are unsatisfactory to supply the character of science demanded by the technique. For example, Nelson (2016), in his article, *Scientific bases of the polygraph evaluation*, develops this topic around a mere description of the whole process that includes the polygraph evaluation, using formal technicalities to explain each operation and procedures mystically employed by the examiner. Also, it transforms statistical subjects referring to the accuracy of the technique and some physiological and psychological bases that support the detection of the lie; but in essence, it leaves aside indispensable components for all philosophy of science, especially scientific laws.

Another exemplary document on this topic, and of which it is essential to mention, is that made by Krapohl (2013): *A bibliographic review of the principles of polygraph*; same in which reference is made to 20 premises that have left their mark on the theory and practice of polygraph. These bases, compiled from various studies, aim to guide the professional examiner to direct his evaluations with ethics, technique, and scientificity. However, the essence of these principles, obey rules and technical recommendations supported in research but are not equally dedicated to the first principles of a science (which are not rules or technical recommendations), scientific laws.

Despite this, the publications of Nelson and Krapohl, make extraordinary mention, one of the axioms of the polygraph that in this thesis is postulated, and that was the incipient spark of reason to deduce the here called, the *principle of differential relay*. Same, which is listed in Krapohl's monograph with the number 4, and which states it as follows: "On average, examinees who lie react more strongly to the relevant questions than the truthful examinees react to the questions comparatives. "(Krapohl, 2013, p.31)

As for Nelson (2016), he describes it as follows: "Deceptive examinees generally exhibit greater magnitude of change in autonomous activity in response to relevant stimuli than to comparison stimuli, whereas truthful examinees will generally exhibit greater magnitude of change to comparison stimuli that to the relevant stimuli ... "(p.74)

On the other hand, the work of Shurany and Gordon (2016), of epigraph: The pretest interview; the basis of the polygraph, suggests to be in a first approximation, a book that presents the radical foundations where the polygraph is based; however, in its argumentative development, it shows a theme based on the description of the different operations carried out during the pre-test phase of the polygraph evaluation, providing a series of counseling sessions based on the authors' expertise to address each of the operations that comprise this stage of the examination. Also, they add at the end a set of formats that they recommend to use during this phase. Then, then, the expectations of finding the scientific foundations of polygraph end up being very distant; nevertheless, the contribution ends up being very enriching.

In contrast, Nathan Gordon (2017), in an

individual authorship, develops his book, *Essentials of Polygraph and Polygraph Testing*, on a logistics of historical background, rules for formulating questions, generalities of instrumentation, a brief notion of psychophysiological, some formats of technical and polygraphic ethics; nevertheless, a related capitular is not appreciated on the supreme principles of the polygraphic discipline where it bases its practical action.

One more title that was consulted in order to find documentary evidence on the subject of the polygraph postulates, was the work: *Handbook of Polygraph Testing by Murray Kleiner* (2002), which serves as the coordinator of it, because this bibliography is integrated for a series of scientific dissertations on specialized topics, but where the subject of interest for this research is also absent.

For his part, Tuvya T. Amsel (2014), in his book: *Practicing Polygraph: Best Practice Guide*, addresses the issue of the "foundations of the detection of deception" from a traditional perspective with the psychological set and the fear of being discovered ; however, it visualizes the importance of changing the topic of the first foundations of a preliminary form, since after this core section a series of very fine technical issues are developed, of which, without the preamble of the rationale, it would not be possible its technical credibility.

Finally, the last bibliography consulted in order to find information on some type of dissertation aimed at enunciating the principles or laws of the nature of the detection of lies was Scientific Validity of Polygraph Testing: A Research Review and Evaluation (1983) the Technology Assessment Office of the United States Congress. Scientific document where this subject is poured under the rubric of "polygraph theory". This section is developed from an equally traditionalist orientation, based on the idea that when a person is examined, he fears detection, and that fear generates a measurable physiological reaction when said person responds deceptively.

In sum, it is encouraging to mention that, in none of the dissertations previously reviewed and considered possibly as milestones in the bibliographic reference on the subject of the scientific bases of polygraph, was found documented any issue that conceives "specifically" the epistemic component of the foundation the most superior of all science, the "scientific laws". Situation, which is interesting because it allows confirming the hypothesis of the theoretical absence of this epistemological element within the theory of polygraph currently available; It was the motor that motivated the design of this scientific-philosophical study and that will most likely make a mark in the history of this science after having understood the transcendence of the nomological statements presented here.

In short, the rational evidence leads us to deduce that the methodological engineering of polygraph rests on a system of laws of neuro-psychophysiological and statistical nature, covering aspects of cognitive, emotional, physiological, conditioning by learning and rational decision making by statistical frequency.

Namely, the Laws that were deduced are:

1. Mental identity principle
2. Directed thinking principle
3. Recognition memory principle
4. Potential difference principle
5. Statistical significance principle

These nomological rules are not absolute and invariable, because like all the laws of nature (of any sector of science in general) they act within the limits of normality; the apparent contradictions or inconsistencies of the non-fulfillment of the axiom are considered as exceptions to the rule, given that these limits of action are bounded by a negative law (or several) that opposes the regularity of the natural phenomenon discovered and verified empirically in advance investigative Finally, nature is endowed with positive and negative laws that always seek a balance.

Given this it is important to bear in mind that the postulates that drive this lesson, should not be considered as the last word, because they are the first approximation to this theoretical framework absent in the theory of polygraph, it is clear that no study, or conspicuous researcher by itself, can possess the absolute truth. Here it is necessary that future research can validate, strengthen or reformulate the first principles promulgated here, to then have a much stronger theoretical - philosophical substructure where polygraph examiners can have certainty and confidence in their diagnoses.

That is, the postulates will have important implications in the scientific basis of technical diagnoses, since the documentary presence of these nomological regularities will allow the polygraph technician to have greater rigor and scientific security in their technical opinions, and in turn, to face any debate where you have to argue the scientificity of the discipline and the diagnosis; which will allow polygraph to enjoy theoretical fullness on the three guiding axes that demonstrate the scientific character of any factual branch of human knowledge: statistics, experimental methodology, and philosophy of science. The latter, chapter where scientific laws are concentrated.

As Hempel (2005) correctly states, the hypotheses of universal form or general laws, constitute the common base of diverse procedures of the sciences (p.307); which are provided with diverse operations to achieve completion of their technical processes. These technical practices are designed on the guidelines of the natural laws that govern the specific phenomenon of their competence; which means that the technical procedure of professionals to perform their tasks and meet their objectives are not executed by creativity, occurrence or causality; they are procedural actions duly designed to the scientific laws of the phenomenon of their intervention.

For this, let us think for a moment of the procedure of a paramedic when performing cardiopulmonary resuscitation maneuvers. Empirically it is proven that it is possible to maintain for a few minutes the life of the brain and tissues after a cardiorespiratory arrest, from artificially

oxygenate the blood and make it circulate through the lungs, brain, and tissues. This is done by professionals pressing the chest to press blood vessels (like a sponge) and make it possible for blood to circulate. With respect, the insufflation is done to try to introduce oxygen to the lungs and that they can oxygenate the blood that is circulated inside them. (Reyes, Aristizábal & Leal, 2006).

Examples like these abound in factual science; nevertheless, a remarkable simile is the technique used by a forensic scientist in road accidentology to determine the speed of a motor vehicle through the linear measurement of the tire friction footprint and the application of a mathematical equation, where the value of the length of the braking footprint becomes absolutely relevant. At first glance, this would seem very risky and incredible, but the protocol of action is based on the "law of conservation of energy" which explains, that, "the energy is not lost or destroyed is only transformed, which , allows us to establish that the momentum of the vehicle became a braking labor, performed by the mechanical braking system when locking the tires, taking advantage of the friction forces that appeared between the bearing surface and the tire, allowing to stop the vehicle after leaving a print. "(Hernández, 2008, p.206)

This allows us to understand the words of Hempel, because ultimately all the technical processes of action of the factual sciences, including especially polygraph, are designed on empirical regularities universally proven. In such a way, that the system of laws of the polygraph that in this work are postulated, base the reason of the reason of each one of the operations that are executed during the phases of the pre-test, in-test and analysis and interpretation of data; same that make feasible that the detection of the lie by means of the methodology of the polygraph is a reality.

On the other hand, it would be advisable that subsequent studies focus on performing statistics within the polygraphic epistemic community on the confirmation, rectification or non-recognition of each of these principles because only in this way, these scientific-philosophical postulates objectively achieve the property of "universals". This is due to the nature of the subject of study, which is philosophical, because, if it were an empirical thesis, arbitration would only be reduced in reproducing the scientific formula that the author publishes. On the other hand, it is necessary to carry out parallel studies to verify if these laws of the polygraphic detection of the lie have applicability and constant relation with the phenomenon of the detection of the lie in general, including to other detection systems and protocols; although adventurously, the author cautiously guards certain affirmation for this universality.

Finally, as mentioned above, one of the main limitations of this study is reflected in its epistemological nature itself, because the theme of "scientific laws", in general, is a theoretical - empirical concept that is not perceptible but knowable; that is to say, that the understanding of these constant and regular directives of nature, of mind and of society, are not possible at the sensible level (of the individual), but intelligible (for the general).

Hence, one of the main drawbacks is that only experts in polygraph can understand the regularities that govern the phenomenon of polygraph detection of lies; in such a way, that laypersons in the matter or others totally will need the assistance of a professional for a correct interpretation.

CONCLUSION

At the forefront, this thesis has allowed to dimension the mold and transcendence of the Philosophy of Science (also called Epistemology) in the formal and factual disciplines, and especially, of polygraph; it is usually present in all truly scientific fields in the form of a theoretical substructure where the technical and speculative theory is regularly based; in it, lie the bases from which the derived and more complex knowledge of a particular science is built and founded. Furthermore, in this epistemological theory lies the most primitive empirical foundation that allows knowing the more or less stable behavior of the phenomenon of study; because from these regularities of nature, the scientist who applies the science, can establish diagnoses, explanations, predictions, treatments, technical procedures, theories and develop technological artifacts. This fundamental unit of scientific knowledge is known as the "Scientific Law".

This study made clear that the theory of polygraph, currently available, is in a precarious state with respect to its field of Epistemological foundation, because it has presented major advances in research in the Statistical and Methodological Experimental sector; situation that has left in evidence that his theory lacked the explicit and specific enunciation of scientific laws that describe those natural regularities that intervene in the process of polygraph diagnosis of lying.

To obtain this approach, the research was based on the experimental-rational philosophical method, and basically consisted in revealing the natural neuro-psycho-physiological and statistical principles that have been immersed implicitly in the methodological engineering of polygraph; hence, that the polygraphic epistemic community, despite having been able to verify with empirical evidence that its diagnostic methodology works -with its respective margins of error- has not been able to explain the scientific scrutiny of why it works.

Precisely, this research aims to replace this theoretical gap with the first principles are postulated here, because the only way to dispel this unknown, lies in the Theory of Science (Epistemology), and especially in certain laws of human nature, physiological and of the mind, which are tacitly immersed in the process of polygraph detection of lying.

In short, the results of the study suggest that the methodological engineering of polygraph has rested on a system of laws of cognitive, emotional, physiological, conditioning by learning and rational decision making. These postulates-as mentioned above- are not new, much less created; they are natural laws that were brought to light within the methodological mechanism where they lay, and that, it is important to mention, that they have been enunciated and studied in advance in other matters of human knowledge, such as the philosophy of the mind, the neurosciences experimental, statistics and clinical psychophysiology itself; how-

ever, considering that science in general and its universal laws form a system of global equilibrium and interrelation, these can intervene in several natural phenomena. For this reason, given the psychological context of the task of detecting deception in a polygraph examination, these axioms converge administratively and take relevance in the polygraphic process to make feasible the probabilistic identification of mendacity.

Namely, the universal hypotheses are:

1. Mental identity principle
2. Directed thinking principle
3. Recognition memory principle
4. Potential difference principle
5. Statistical significance principle

It is worth mentioning that the reader will be able to appreciate, during the study of these premises, that these will reflect a systematization according to each phase of the polygraphic evaluation; in such a way, that each principle explains and bases the reason of each procedure that integrates the polygraphic methodology. It should be remembered that all the procedural phases that make up a scientific technique are based on more or less stable natural constants.

Likewise, it is important to note that these laws - like any other laws of a scientific nature - do not claim to be absolute or almighty, because they operate within certain "limits of normality", where the apparent contradictions, or non-compliance with the law, will give rise to the meanings of the rule.

In short, this work does not intend to be seen as the last word, but as a first approximation and ultimately, further studies of an epistemological nature are needed to confirm, replace or reform them, but without a doubt, they are a good start to build the **philosophy of the science of polygraph.**

Finally, it would be advisable for future research to analyze the laws of polygraph to verify if its applicability is also the phenomenon of the detection of lying in general, regardless of the technique, system or detection procedure. A situation of which the author visualizes a good omen.

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School Solution for the scoring exercise starting on page 29

1st Presentation

	Subtest A	
	R1	R2
Pleth	1	1
P1	0	0
P2	0	0
EDA	2	-2
Cardio	1	-1
Total	**4**	**-2**

2nd Presentation

	R1	R2
Pleth	0	0
P1	0	0
P2	1	0
EDA	0	2
Cardio	1	NS
Total	**2**	**2**

3rd Presentation

	R1	R2
Pleth	0	0
P1	0	0
P2	0	0
EDA	0	2
Cardio	1	0
Total	**1**	**2**

TOTALS	**7**	**2**

DECISION **NSR**

Notes

The sensitivity of the motion sensors was exaggerated for visual purposes. Chart scoring notes:

On the respiration/PLE tracings:

1.In this case, I attributed the same scores between the computerized and visual scoring for both PLE and respiration.

On the EDA:

1.The C1C2 was determined as an early rise. I compared C1C2 from the first drop onward.

On the cardio tracing:

1.The cardio tracing was stable in the ACQT, and the examiner observed two sudden drops in the tracing after R2R2 (2nd presentation of R2), and C2C2 (2nd presentation of C2). The cardio cuff was adjusted for the subsequent chart, and no other drops were observed. We later consulted with one of our physicians who concluded that the sudden drop was likely cuff related (i.e. slight cuff movement), and not physiologic, on the basis that other channels were not affected whatsoever.

2.R3R1 (3rd presentation of R1). An early rise is observed, however I noticed a slight drop on the cardio tracing in the latter portion of the scoring window. For this reason, I attributed a +1 score for C2C1.

On the multiple motion sensor:

1.The sensitivity of the motion sensor was exaggerated for visual purposes. The movements largely occurred outside of the scoring windows, except for R2R1 (2nd presentation of R1). The examiner scored this question on the basis that the remaining channels did not appear affected, and the unaffected comparison questions generated plus scores, despite the distortion on the RQ.

The examiner opted to score R2R1 (2nd presentation of R1) on the basis that the other channels did not appear affected, and the unaffected comparison questions generated plus scores. Note that I would also support not scoring this RQ, in favor of running a short chart (4th presentation), as permitted for the DLST, in the case of a distorted RQ.


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