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OF TEXAS

THE EVOLUTION AND FUTURE OF POLYGRAPH IN LAW ENFORCEMENT

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DEFINITIONS

Afferent --conveying toward the center or specific site or reference.

Auricle --an ear shaped apendage of either atrium of the heart.

Brachial artery --main blood supply for the arm.

Cardiac dyspnea --labored heart function.

Centres --a center location.

Cerebro spinal --Pertaining to the brain spinal cord.

Diacrotic notch --distinguishing feature produced by the closure of the semi lunar valve of the heart.

Efferent --conveying away from center as an effernt nerve.

Galvanometer --A instrument for measuring current by electromagnet action.

Ganglic --a group of nerve cells located out of the C.N.S.

Innervated --the supply of nervous energy sent to one part of the body.

Kymograph --transport chart paper at a constant rate of speed.

Phremic --diaphragm of the mind.

Plethysmograph --recorded cardiovascular changes through finger attachments.

Pneumograph --instrument for recording volume change in respiration.

Psychophysiological --physical response or movement of the body systems caused by outside stimulus.

Psychological set --a given situation of significant importance to himself when attention is involuntarily channeled towards that which holds the greatest immediate threat to his well being.

Sinoatrial --Pertaining to the sinus venosus and the abrium of the heart.

Somatic --pertaining to the body wall in contrast to the visera.

Sphygmograph --instrument that records the character of the pulse and blood pressure changes.

Stimuli --influence that causes reaction.

Synapses --junction between any two nerves.

Viscera --plural of viscus, any large interiors body organ in any of the four great body cavities especially those in the abdomen

I. INTRODUCTION

Since the invention of the first crude instrument in the detection of deception, its role in our society has been greatly enhanced. This device known as the polygraph instrument has been improved upon as technology allowed. Along with its success, came many unforeseen misconceptions and skeptical observations. The term "lie detector", associated with polygraph testing early on, may have harmed the public perception. Experts in the field of polygraph work agree a better label would be truth verification. In the hands of a highly trained examiner, polygraph testing has proven to be very useful to law enforcement as well as the private practice. Professional examiners demanding higher standards through individual state regulation and national associations are directly responsible for the success of the polygraph field. In 1923, the courts ruled in Frye v. United States Ct ct 210 ctc325, polygraph had not reached the degree of acceptance within the scientific field to be accepted as evidence in court. After 50 years of improvements in technique and instrumentation, the decision was overturned. The fine line between scientific methods and moral issues may have brought about the first time federal regulation of all states. This regulation is the Employee Polygraph Protection Act of 1988 (E.P.P.A.). This federal regulation has far reaching effects on polygraph testing altogether; however, the direct effect on private

practice was devastating. Some in the polygraph profession feel the existence of such unwarranted regulation may be the first step to totally abolish polygraph testing in its entirety. Others feel the federal regulation is self defeating and will bring about stronger regulation. What happened, did polygraph testing become too good? A more informed understanding of how polygraph works and the application used today should help us realize how useful this tool can be, and how close we may be to losing the polygraph.

II. HISTORY AND DEVELOPMENT

The truth eludes everyone from time to time, the reason for this may be acceptable by society. Psychologists have stated that "failing to tell the truth" may be a perfectly normal defense mechanism. Unfortunately, all folks walking may not possess a perfectly balanced set of defense mechanisms. The adage of "the truth shall set you free" may not be completely self fulfilling for a criminal who is about to admit involvement in an act which will put him in jail for the rest of his life.

The need for a solution to determine if someone is telling the truth may have been thought about at the very beginning of mankind. There is no way of telling for sure what early man thought as records had to be etched in stone tablets. The very early recording of man's attempt to determine deception came in several different techniques and/or beliefs.

The oriental people used the rice in the mouth method to determine deception. The basic belief was if the person was in fact deceptive, he could not spit the rice out of his mouth because of the dryness. They did not realize the medical reason for this dryness, but by experience of one's own life they knew it occurred.

During the biblical period, King Solomon was confronted by two women who claimed the same child. King Solomon had

to make the choice. He ordered the child be cut in half. The real mother gave up the child.

In early China they believed deception could be determined by giving the person a piece of hot metal to hold in his hand. If the wounds healed within a certain period of time, he was considered to be truthful.

One other example practiced in India was called the "Dark tent" method. A subject was ordered to go into a dark tent and touch the tail of a sacred ass. The tail was coated with a black material or substance. If that person came out of the tent with black hands, he was then considered to be truthful.

These methods of truth verification were based on very little scientific research, as crude and barbaric as they appeared, the need to use something was present. As necessity being the mother of invention, several early pioneers were responsible for the basic ideas behind the modern day polygraph instrument.

In the middle of the nineteenth century, Dr. Hans Gross, an Austrian known as "the father of criminologists" defined the search for truth as the basis and goal of all criminal investigations. In a certain sense, he asserted, "a large part of the criminologist work is nothing more than a battle against lies. He has to discover the truth and must fight the opposite. He meets the opposite at every¹ step".

In 1895, an Italian criminologist by the name of Cesare Lombroso was using some scientific and mechanical equipment already invented for the medical field to determine truth. Lombroso based his findings on changes or lack of changes in blood pressure and heart beats while the subject he underwent examination. This test was accomplished by the subject's hand being placed in a sealed beaker of water. The theory was the greater the blood pressure in the hand the more water would be displaced thereby creating more air pressure in the sealed beaker. Lombroso made use of a rotating drum called a Kymograph to record these changes. Lombroso's experiment was widely recognized by several inventors; however, it was felt more scientific means should be sought out. The criminologists felt existing scientific equipment designed to test human emotions could determine if a person was lying or telling the truth.

Another contribution was the work done by Angelo Mosso. Mosso used the invention of Francis Frank called a plethysmograph. Mosso's major study was heart blood volume and respiratory change. He was able to measure emotion and fear. Mosso used the kymograph to record blood pressure changes through a couple hooked up to the person's ankle. He also incorporated the use of a styles located at the head of the balance beam believing that fear would cause the blood to rush to the internal organs near the center of the

body causing the head to rise. The work of Luigi Galvani whose expertise was in the medical field found that living tissue had an electrical current present. A German inventor, who's name is unknown, developed an instrument using the Galvani theory. He gave the credit to Galvani by naming the instrument a Galvanometer. In 1907, a man named Veraguth used word association in conjunction with the Galvonic test. He used an electric coupler placed on the finger charged with current. This current would react to physiological changes occurring in the body. He determined that sweat was not a factor in the measurement. In 1914, Vitorito Benusso found that respiratory changes could also indicate deception. In that same period, about 1915, William M. Marston developed the sphygmograph. This device was similar to the blood pressure cuff; however, Marston took several blood pressure readings during the interview. He felt the higher the readings the greater probability of deception.

Many people were found to be great contributors to the components of a "lie detector"; however, it took the efforts of three other men to come up with a workable device. The men are Dr. John A Larson, an ex-police officer in Berkeley, California who later became the state criminologist of Illinois; August Vollmer, the founder and chief of Berkeley's "scientific police department"; and

Leonarde Keeler, a police officer who later became a staff member of Northwestern University's Scientific Crime Detection Laboratory. In 1920, Chief Vollmer, the highest ranking police officer to support the introduction of the device, worked together with this team to come up with a functional instrument. This same basic concept is in use today called a polygraph. The prefix poly - means more than one tracing. The word graph - is recording a diagram that represents the verification of a variable in comparison with² that of more other variables.

The polygraph instrument, when refined by Dr. Larson, would record three areas of human body responses. The blood pressure, respiration, and electrical skin response. These tracings were recorded simultaneously during a polygraph test. It was discovered very quickly by all involved the instrument was not a "lie detector", but only a device which recorded changes in some of the body systems.

III. THEORY OF OPERATIONS

The knowledge of how to operate an instrument, ask a series of questions, and note obvious responses on a chart, can be learned by anyone. But, the complicated psychophysiological phenomena taking place within the mind and body at the time of a test requires acute and constant study. "A successful test conclusion, based on fairness, impartiality and objectivity, and the accuracy of chart interpretation, can not be obtained without a comprehension understanding of what takes place in the human body to produce what we have termed deviations from physiological norm".³ The polygraph instrument will record all the physiological responses during the test, but to better these responses we need to understand what causes them. The term psychophysiological in simple language means psychological induced responses of a system in the human body. To be psychological induced, the stimulus must be picked up through one of our five senses such as hearing, smelling, seeing, or touching. If the body receives these stimuli, the brain will convert these messages and signals to the appropriate system of the body. The master communicator of this signal is the central nervous system. In polygraph testing the external stimulations (voice commands) are transformed into organic behavior (physical movement) by the autonomic nervous system.

The autonomic nervous system has the ability to influence tissues and organs in distant parts of the body, relying primarily on rapid electrical transmission of nerve impulses over nerve fibers. Transmission between individual nerve cells and between nerve endings and the cells innervated is chemical rather than electrical. This chemical transmission is thought to take place through the release of small amounts of transmitter or mediator substances from the nerve ending. This chemical agent then crosses the space, or synapse, by diffusion and combines with a special receptor on the next nerve cell or the structure innervated. This combination brings about a depolarization and activation of this structure.

Within the nervous system, one can discern two major functional divisions. One division is largely automatic or "automatic" in its operation. It does not require conscious activation, although one can influence this nervous system by conscious thought (i.e. the speeding of the heart with a frightening thought). This division of the nervous system is concerned primarily with those functions which are necessary for maintenance of life such as: cardiac function, control of blood pressure, digestion, and elimination. The other component of the nervous system, the somatic is largely non-autonomic and is concerned with consciously controlled functions, such as respiration, locomotion and

posture. Anatomically it has only one neuron leading from the CNS to the structure innervated. The autonomic nervous system connects with the cerebro-spinal nervous system but relatively independent and self-directing. Smooth muscle, cardiac muscle and glands in general, have two sets of efferent neurons for the regulation of these activities. One is the sympathetic set; the other is the parasympathetic set. The two constitute the efferent or motor side of the autonomic nervous system and provide for an automatic⁴ reflex. Clearly, the two divisions of the autonomic nervous system differ not only anatomically, but their functions as well. Most viscera, but not all, are innervated by both type of neurons. Stimulation of one division usually produces effects just opposite to those noted upon activation of the other. In other words, one will act as a "brake" and the other as an "accelerator" to certain organs. This makes for a convenient and effective mechanism. For example, if the blood pressure would fall, activation of the sympathetic system will, by cardiac acceleration and vasoconstriction, oppose the fall and quickly restore the blood pressure to normal limits. If the pressure rises, the parasympathetic system brings about a lowering of the pressure by decreasing heart rate and dilating blood vessels. To better understand the two sides of the autonomic nervous system, W. B. Cannon describes the

"fight or flight" mechanism. If one is awakened in the middle of the night by the sudden slamming of a door, a great many autonomic efferent impulses are set up by the stimulus. The pupils dilate, the hair stands up, or at least a "gooseflesh" condition of the skin occurs, the heart beats fast, the blood is directed to the muscles which are tensed, and respiration is increased. In short, the whole body is put on the alert and prepared to do battle or flee. At the same time, those bodily functions that, for the moment, can be of no assistance, are suppressed. Digestion is slowed, the bladder wall musculature remains relatively relaxed, and the activities of the sex organs are inhibited. It is the sympathetic division of the autonomic nervous system that takes charge in an emergency and the parasympathetic that is in a relaxed state.

These two sides of the autonomic nervous system and how they react are the very core for the theory of polygraph testing. To better understand this research, just remember sympathetic emergency, and parasympathetic peaceful and quiet. These terms will be used later in the question formulation and chart interruptions.

Now that we have established physiological responses and the causes the next step would be introduction and recording of these changes. In review, the polygraph instrument is built to record changes and the human body has

the ability to make physiological responses if stimuli is received.

The connections are made through different types of accessories which are attached to the body and the polygraph instrument directly. The three major areas of the human body monitored by polygraph instruments are: breathing (respiratory), galvanic skin resistance and the heart or circulatory system.

To understand the first part of the polygraph instrument - the pneumograph, one needs to have an idea of what the human body is doing in the respiratory cycle. Inspiration may be accomplished by coastal or abdominal muscle. Air is drawn to the lungs at a rate in the average adult of sixteen to eighteen breaths per minute. Labored breathing, sometimes associated as deceptive criteria, occurs as a result of severe effects of a stimulus. The muscles of inspiration are assisted by inspiration auxiliaries attached to the chest by contraction increase the thoracic cavity directly or indirectly. If movements become excessively labored, coordinate action of every muscle in the body can directly or indirectly increase the cavity of the thorax. In full breathing, the lungs are filled as completely as possible voluntarily, as in determining the amount of complementary air, or involuntarily, as in cardiac dyspnea. The expulsion

of air is accomplished as a result of muscular activity, as in forced respiration. The muscles used in respiration are: the abdominal wall, the internal intercostals, serratus posticus inferior, and quadratus lumborum. The external mechanical respiratory process involves contractions of muscles and movements of the ribs and sternum, whereby air is inspired into the lungs and then released, liberating carbon dioxide.

The internal respiratory process involves carriage of oxygen and carbon dioxide by the blood, the passage of oxygen into the cells and its utilization there, and the reverse processes with carbon dioxide. Control of respiration is provided by the autonomic nervous system from automatic centers in the medulla, and center in the spinal cord. The phrenic nerve, and peripheral nerves along with occasional afferent regulators occurring in response to some visual or auditory stimuli.⁵

The function of the pneumograph section of the polygraph instrument is to record the breathing of the respiratory patterns during the inhalation and exhalation stroke of the subject being tested and any changes thereof. The physical contact made with the subject is made possible by using the pneumograph chest tube. The chest tube is basically a corrugated rubber tube with a spring or rubber band inside to allow it free movement. One end is seated

and the other end is attached to a rubber tube that is connected to the polygraph instrument. Most instruments utilize two chest tubes, one for the upper and one for the lower or stomach area. The function of the pneumograph chest tube assembly is to pick up the movement of the subjects chest being tested during the inhalation and exhalation process of the respiratory system and transport the motion to the pneumograph section of the instrument. The air is directed to a metal bellows which is attached to a lever. The lever moves a cradle back and forth as the pressure is changed from positive to negative force. On top of the cradle sets the ink pen which marks graphs or lines on the paper as it is moved under the pen. This procedure records each breath taken and the amount of time used in the breath.

The next area of the polygraph instrument is called the galvonograph or (G.S.R.). The function of the galvonograph is to record the electrical skin resistance of the subject being tested and any changes therein. The skin is defined as an external covering of the body, consisting essentially of two layers, the epidermis and the corium. The epidermis is composed of four layers of stratified epithelium. The corium is composed of connection tissue containing lymphatics, nerves and nerve endings, blood vessels, sebaceous and sweat glands, and elastic fibers. The basic

functions of the skin is protection against injuries and parasitic invasion. It also regulates the body temperature and aids in elimination of waste products. The skin was chosen to represent psychophysiological aspects pertaining to the galvanograph pen recordings of the polygraph instrument. While the most inconclusive, sometimes accurate, and controversial in the instrumental detection of deception, galvanic activity is probably the result of a combination of mental, visula, auditory and muscular, motor, and sensory nerve actions recorded through changes in sweat gland activity. These changes are basically recorded increases and decreases in a subjects resistance to a constant electrical current generated through special components of the polygraph instrument. The galvanic cells of the body generate a return or matching form of electricity through the chemical secretions of various neurons, thus synopses and impulses, as a result of some stimuli. The skin contains many sensory nerve endings applicable to polygraph testing. Since galvanic recordings are the result of stimuli causing a change in sweat gland activity, we can see that almost any bodily activity can have some bearing on the more active areas of sweat gland action such as: forehead, arm pits, the bottom of the feet, and the hands. Some experts believe that some actions of all the major systems of the body directly or indirectly

produce changes in sweat gland activity. Thee major systems include mental stimuli, visual and auditory stimuli, circulatory, and respiratory and skeletal movement.

The polygraph instrument galvonograph section attaches to the subjects fingers by electrodes. These electrodes utilize small contact plates which are held in contact with the fingers by Velcro fasteners. The circuit is then connected to the galvonic section by small electrical wire. Cells of the body have positive and negative charges when at rest. When the cells are acted upon by stimuli, a small amount of electrical energy occurs. The galvonic section, by use of electrical circuits, can balance the exact amount of electrical resistance in the body. Resistance is the opposition offered by a body or substance to the passage of a steady electric current which is expressed in ohms. This power output contained in the finger electrodes is approximately 1/2 volt and 50 microamps. The voltage amperage combination is very small and can not be felt by the subject. The galvanometer is connected to a ink pen which records, on the moving chart paper, any and all resistance imbalance or change. Increase in the skin resistance will cause the pen to go down; consequently, decrease will cause the pen to go up.

The last section of the polygraph instrument is called the cardio sphygmograph. To better understand the cardio

section, it is necessary again to know the function of the heart in the human body. The heart is a hollow, muscular, contractible organ, and the center of the circulatory system. Contraction of the heart, or its cavities, is called systole, dilation is called diastole; both represent the cardiac cycle. The heart is divided perpendicularly from base to apex into two parts having no communication with each other. The left side carrying the arterial blood and the right side the venous blood. Each side is divided into two separate cavities, the lower of each called a ventricle and the upper of each called auricle - connected by an orifice and guarded by a valve. The nerve supply (inhibitory) is by way of the vagus or pneumogastric nerves; acceleratory supply is by way of the sympathetic ganglion in the autonomic system and phrenic nerve. The afferent nerve is a depressor nerve running from the heart to a cardio inhibitory center in the medulla, through the sheath of vagi nerves, causing reflex inhibition of the heart. The average human heart beats 72 times a minute. The first sound of the heart (systolic) results from contraction of the ventricle, tension of the auricle valves, and the impact of the heart against the chest wall. It is synchronous with the apex beat and carotid pulse. This sound is prolonged and dull. After the first sound is a short pause, then the second sound (diastolic), which results from the closure of

the aortic and pulmonary valves. The ventricle contracts at a much slower rate than the auricle. The contractions begin at the sinoatrial node, or normal point, but they are interrupted before they reach their destination. The pulse is very slow - usually under thirty. In some cases, this is a perfectly normal defect; in others, it may be a serious heart disease.⁶

Stimulus from the parasympathetic system tends to slow the heart rate. Stimulus from the sympathetic system tends to increase the heart rate. In most cases, cardio activity is received from the brachial artery which is a main artery of the arm. The polygraph instrument cardio section makes physical contact with the body using the standard arm pressure cuff. This cuff is wrapped tightly against the brachial artery and with a pump bulb, enough pressure is applied to determine the subjects means blood pressure. Means blood pressure is stated as diastolic pressure plus $1/3$ to $1/2$ of the pulse pressure. The function of the cardio sphygmograph section is to record the relative blood pressure, the heart rate and the pulse wave amplitude of the subject being tested plus any changes thereof. The pressure and rate have fairly standard meaning. The pulse wave amplitude is the amount of force that the pulse comes into contact with the cardio arm cuff, which causes the arm cuff to rise, producing an increase in pressure. These pressure changes are transmitted to the

polygraph instrument via a sealed rubber tube, which is connected to a metal bellows. This bellows will flex as pressure differences are encountered. It is attached to a series of levers which allow the ink pen to move, thereby making a recording of the heart in a graph form. Cardio tracings have a unique form known to examiners as a dicrotic notch. This dicrotic notch is produced by the heart during the closure of the semi lunar valve. The exact location of the dicrotic notch on the graph is useful to examiners in determining an average of the means blood pressure.

IV. TECHNIQUE

It is believed motocross races are won or lost in the corners. The same is true for polygraph testing as far as question formulation is concerned. If questions to be asked in a polygraph test have not met certain guidelines they will produce ineffective results. The very tone the examiner uses in his voice if not constant may vary the response recorded by the instrument. One phase of polygraph testing is the pre-test interview. This interview puts the polygraph examiner and the subject in a one-on-one interview. The reason or the target of the conflict is discussed by both parties. The examiner in this interview determines the background of the subject, his values, mental and physical status, and the attitude about his very presence. In talking with the subject the areas of conflict are brought out openly and discussed in the same words used by the subject. The main objective of the examiner in this interview would be an understanding by both the subject and the examiner of exactly what questions he is asking and the exact answer given by the subject. All test questions are somewhat standardized through a set of guidelines. These rules should be used on every polygraph question.

1. The question must be simple and understandable by the subject.
2. The question must not contain any emotional producing words.
3. The question should be answered with a "Yes" or "No".
4. The question should be as short as possible.
5. The question should never contain any inference which pre-supposes knowledge or guilt on part of
6. subject. A question must refer to one offense only.
7. A question must refer to one element of the offense.⁷

Using these guidelines produce several important values; however, the most useful reason would be efficient ease of overall chart interpretation. Interpreting charts is difficult at best, factor in poor response by the use of a bad question, only makes the task of chart interpretation twice as hard. Standardizing questions used in polygraph testing will give an expected results.

The standardization should also include test construction. Test construction is the type of questions used and the order they appear on the completed test. The

three basic types of questions used on all polygraph tests are relevant, irrelevant and control. The relevant question is one that relates directly to the matter under investigation. It is designed to produce an emotional response from a deceptive subject. The irrelevant question is easily the opposite. This question does not relate to the matter under investigation. It produces the least amount of emotional response and seeks a normal truthful answer. The last type of question used, the control question, does not relate directly to the matter under investigation, but it will relate to a similar type of offense but somewhat of a lesser degree. It is designed to produce an emotional response from anyone.

The arrangement of questions on a particular test can vary drastically. Several styles or techniques have been proven effective. For simplified understanding, the I and R technique will be utilized. The basic theory of the general I & R test sequence was set up to have the subject being tested, relax and gain his composure in the period before and after the issue or relevant question. Remember, the polygraph examiner's goal is to create a test which is fair and impartial. Most people believe themselves to be basically honest. It is against the law of nature for any man to be deliberately dishonest, hated or disrespected. When he practices such deceit, the mechanics of his body's

fight or flight mechanism commences operation to prepare for an emergency. This uncontrolled response is the building block for the theory of polygraph operation. Some of the theories are different in the way they are written but may possibly mean the same or at least cause the same emotional response. Dr. Gordon Barland feels one theory is what he calls the "Intellectual Awareness Concept". The individual is aware that the questions are different from one another and identifies with the ones that propose a threat to him. Dr. Gordon believes another theory of "Motivation". The individual's attempt to keep from being detected; the harder he attempts, the larger the response. Mr. Cleve Backster, a renowned figure in the polygraph field, believes in what he calls the "Backster Theory". A person will react to those stimuli (questions) that present the greatest threat to their well being. The results of these theories in action have been termed as a person's psychological set as a specific time in life. The polygraph test questions are so designed in a logical order; thereby, allowing the subject being tested to have an emotional response to either the relevant or the control questions. The relevant question (did you do it) and the control question (have you thought about wanting to do it) are always present in a straight forward polygraph test. When the test questions are asked in a polygraph and the psychological set is real, the

subject's body will respond by an involuntarily emotional response to one of the two questions. In some tested subjects, response will be present in both to some degree, only in that a slight present exists in one of the questions; however, a vigorous response in the remaining question. Evaluating the emotional response on the completed polygraph charts is called chart interpretation. A trained polygraph examiner using objectivity will now compare the recorded psychological response of each question. The purpose is to single out what is called a variation of variables. He is looking for response from a question which is not normal for the subject when compared to those other responses on the chart. He begins this search by comparing the relevant questions to the irrelevant questions. If there is no significant change in the response, he will then compare these responses to the control question responses. Remember, the control question is designed to produce some response from anyone. If the control question results are far greater than the relevant question results, the subject is considered to be truthful. This evaluation being very basic translates to the polygraph examiner the subject being tested has a greater fear concept of something he was not asked about. He (subject) was not stressed by the target of the test, the did you, but more from another issue have you thought about any outside issue.

A deceptive chart would be basically the opposite in which the response in the relevant questions were considered greater than the control questions. Polygraph responses can be graded by the use of numerical system set up by Cleve Backster. It was determined by using his method a more accurate chart evaluation could be made. The opinion rendered by the examiner for the completed results of the chart interpretation falls into three categories. These are truthful, deception indicated and inconclusive. Polygraph tests generally require two testing charts. These charts are evaluated individually to determine the findings. If one of the charts cannot be properly interpreted because of problems with the subject's health, or any of several reasons including poor question formulation. The charts result may be classified as inconclusive. The examiner is unable to render any opinion of the subject's test results.

The question of validity in polygraph testing seems to stem from its inability to be used in court. In the Frye v. United States case, an affluent physician of Washington D.C., by the name of Dr. Robert W. Brown, was shot to death in his office. A reward of \$1,000.00 was announced for the conviction of his killer. Approximately one year later, in 1921, James Alphonse Frye was arrested on robbery charges. When questioned about the doctor's murder, he at first denied it, but later admitted and confessed to the crime.

After Frye had obtained counsel, he told the attorneys he in fact did not murder the doctor, but only confessed to collect half of the reward he was promised. Frye had no alibi and no witnesses to support his claim. The lawyers turned to William Marston, a polygraphist, to test Frye. The results of the polygraph test confirmed Frye was in fact truthful and was not Dr. Brown's killer. The defense lawyers presented the court with the findings. The judge did not accept the evidence of the test; however, the jury did reduce the charge to second degree murder and spared him by giving Frye a life sentence. James Frye spent approximately 3 years in jail before someone else was arrested for and confessed to the Dr. Brown's murder. The courts following the Frye decision felt not enough study had been collected in the polygraph field. Since polygraph testing combines physiological and psychological theory, the evaluation of the state of the art must include research on the theoretical aspects of the technique. The courts felt it was up to them to assess the progress of polygraph. This finally happened. The Frye v. United States

was overturned by the Briar County Court, Fort Lauderdale, Florida. As far as polygraph being acceptable in court, it has generally been accepted into court on civil cases by all the states. The criminal cases however, is left up to the individual states to decide if their use was considered evidence.

A common agreement for both the defense and prosecution was the trend that followed.

How accurate are polygraph tests? Richard C. Arthur, a polygraph industry expert, felt the results of a properly administered polygraph examination are very accurate. His latest estimate, based on a five year study of those person's tested, resulted in an accuracy of over 96 percent, with a 3 percent margin of inconclusive tests and 1 percent margin of possible error. Many studies were conducted since Richard Arthur concluded his validation. The more indepth scientific validity study was given to Washington D.C., the office of Technology Assessment, known as (OTA). The primary purpose for the validation study by OTA was to revise the policy on polygraph testing by the Federal government in 1983. In order to conduct this assessment, OTA studied the actual polygraph examination process, reviewed the results of prior research reviews, analyzed a wide range of relevant field and analog studies, and surveyed Federal agencies as to their polygraph use of any past, present or planned polygraph research.

OTA felt the basic theory of polygraph testing is only partially developed and researched. The most commonly accepted theory at present is when the person being examined fears detection. Fear produces a measurable physiological reaction when the person responds deceptively. Thus, in

this theory, the polygraph instrument is measuring the fear of detection rather than deception per se.⁶ They further conclude that testing procedures were vastly different between specific issue tests such as those in criminal investigation and those used in personnel screening. The study showed a great percent of accuracy in criminal cases than those of pre-employment tests. This could be summarized by the very fact of post polygraph confessions in those particular cases, they were not sure. OTA further researched the areas of false negatives (countermeasure) and false positives. Theoretically, polygraph testing- whether for personal security screening or specific incident investigations, is open to a large number of countermeasures,- which include physical movement or pressure, drugs, hypnosis, biofeedback, and prior experience in passing an exam. The research on countermeasure has been limited and the results while conflicting suggest that validity may be affected. OTA concluded that the mathematical changes of incorrect identification of innocent persons as deceptive (false positives) is highest when the polygraph is used for screening of personnel. The research also recognized for the polygraph test to be accurate, the voluntary cooperation of the individual is important. Without the full cooperation of the individual, the results will be inconclusive. The polygraph only detects

physiological arousal, and under involuntary conditions, the arousal response of the examiner may be very difficult or impossible to interpret. A major reason why scientific debate over polygraph validity yields conflicting conclusions. The validity of such a complex procedure is very difficult to assess and may vary from one application to another. The accuracy obtained in one situation or research study may not generalize to different situations or to different types of persons being tested. Scientifically acceptable research on polygraph testing is hard to design and conduct. OTA used six prior research reviews depicting an average validity ranging from a low of 64 percent to a high of 98 percent. OTA's own review of 24 relevant studies, meeting minimum acceptable scientific criteria, found correct guilty detections ranged about 35 to 100 percent. They believe factors such as the examiner's intelligence level, state of psychological health, emotional stability, and belief in the "machine", are among several factors that may at least theoretically affect physiological responses. The study further recommended the latest research from the fields of psychology, physiology, psychiatry, neuroscience, and medicine; as well as comparison among question techniques; and measures of physiological response.

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V. LEGAL ASPECTS

On September 1, 1981, the Polygraph Examiners Act became law. The State of Texas Polygraph Examiners Board was established through the 67th Legislature, regular session S.B. No. 441. The Polygraph Examiners Act empowered by Texas Civil Statutes Article 4413 (29cc), section 6(A) and (B), designated rules and regulations. The Polygraph Examiners Act provides for Board regulations, general rules of practice and consumer information. The purpose of the act is to regulate all persons who purport to be able to detect deception or to verify truth of statements through the use of instrumentation (as lie detectors, polygraph deceptographs, and/or similar or related devices and instruments, without regard to the nomenclature applied thereto) and this act shall be liberally construed to regulate all such persons and instruments. No person who purports to be able to detect deception or to verify truth of statements through instrumentation, shall be held exempt from the provisions of this act because of the terminology which he may use to refer to himself, to his instrument or to his service.

The act provides for minimum instrumentation. This requires a subject's cardiovascular pattern and respiratory patterns be recorded permanently and simultaneously. The

reasons probably being to allow the use of psychological stress evaluator (PSE). The act defines qualifications for applicants and required training for interns. The Polygraph Examiners Act provides for testing and license for examiners. It details polygraph testing procedures thereby standardizing the profession. The polygraph examiners Board sets up all license fees and inspection of examiners equipment and practices. The Board is self supportive and operates on revenues generated through fines and fees collected. The Texas Polygraph Board is considered by many states to be very professional and require the highest standards. The rules and regulations adopted by the Texas Board are generally used as guidelines for 34 other states as they adopted state regulations. Up to 1988, the Texas Polygraph Examiners allows for anyone to be tested as long as the test is on a voluntary basis. Stipulations are included making certain the subject being tested is mentally and physically able to undergo a test. There were no differences as to the types of tests taken for example: a pre-employment, criminal, promotional, or periodical. Any employer could by law ask his employee to take a polygraph exam for job related issues. The polygraph profession grew by leaps and bounds. More examiners were licensed and private practice became a very lucrative business. The Office of Technology Assessment estimated two million

polygraph examinations are given a year in which 98 percent are given by the private sector. Almost 75 percent¹⁰ of those given are for employment purpose alone.

Polygraph testing by private and police polygraphists are used in vast investigative fields such as: rape, kidnapping, illegal conduct by public officials, and witnesses and victims whose veracity is in doubt. There were tests given to suspects in a crime requested by defense attorneys. Prosecutors for the District Attorney would test suspects and if they cleared the test, would drop criminal charges that were already filed.

No one could believe what happened next. On June 27 1988, the "Employee Polygraph Protection Act of 1988" became law. The anti-polygraph bill known as House Bill 1212, passed the House with a vote of 254-158. The President, Ronald Reagan, signed the new bill into law that would take effect on December 27 1988. The Employee Polygraph Protection Act of 1988, known as EPPA, was the first time federal regulation was required for polygraph. The EPPA law had the greatest effect on the private polygraph sector and exempted any regulation of federal, state and local government. This new bill changed requirements of employees as well as the polygraph examiner. The highlights and responsibilities of House Bill 1212 are outlined as follows:

Employers cannot suggest or require employee to submit to polygraph test for pre-employment. They cannot use test results from a test taken at an earlier date. Employers are not allowed to test employees periodically or for promotions. They can ask an employee to submit to a test for a specific issue found in an ongoing investigation; such as, thefts, embezzlement or industrial espionage. They must post a copy of the bill provision in an applicable area for prospective employees. They cannot ask any test questions to an employee relating to religious beliefs, politics, sexual behavior, or attitudes of organized labor. They are not allowed to fire any employee for "failed" test results alone. The employer who violates any provision of this bill may be assessed a civil penalty from \$100.00 to \$10,000.00 per day.

Polygraph Examiners who work in the private sector must be licensed by the state in which they work. They must maintain at least a \$50,000.00 bond instead of the \$5,000.00 bond required by the State Board. They must submit in writing opinions based solely on chart results. Examiners can not include recommendation for employment status of examinee. They must retain all records relating to a polygraph test for at least three

years after administering the test. He must keep the test findings confidential except to the examinee or someone designated by the examinee. The polygraph test must be at least 90 minutes in length and no examiner may conduct more than five polygraphs tests per day. He must inform the examinee of the nature of the test, give the examinee a copy of the questions to be asked and advises him he has the right to terminate the examination at any time.

Exemptions include all federal, state and local governments, and their subdivisions from the lie-detector ban. It further exempts consultants under contract to the defense department, anyone assigned to work in government, intelligence agencies. The Bill also exempts employers of non-government firms such as protecting currency, precious commodities, negotiable instruments, electric power transmissions, public water supplies, toxic waste shipments and other materials or operations vital to the public trust. The Bill would also allow testing of employees of controlled substances manufacturing, dispensing and distributing. This new legislation had a devastating effect on the private polygraph industry which brought about
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legislation. The case of Chris Gugas vs Ann McLaughlin Secretary of Labor Department of Labor Calp. Civ. App. was filed in August of 1988. Chris

Gugas, a polygraph examiner and resident of Los Angeles, California, sued in the United States District Court for temporary and permanent injunction against the Employee Polygraph Protection Act of 1988. Gugas sought a declaration from the court that the "Act" was unconstitutional and seeks the injunction while the issue of constitutionality is decided. The cause was based on the plaintiff suffering substantial economic loss as a result of the act. He also felt regulation of polygraph was the duty of the particular state and not federal intervention. Mr. Gugas had to sell his home to fund the lawsuit. The case was thrown out of court.

VI. STATUS OF POLYGRAPH

The commercial polygraph business faced a drastic decline in business. Some estimate their loss to be in the 50 to 80 percent margin. Opponents of polygraph bans estimated future loss to retail business could be as high as 40 billion yearly due to employee theft. Opponents declared if the polygraph is not a reliable investigative tool, conferees should not have allowed its continued use by the government agencies. The membership in the national polygraph organization dropped to a mere 500 members. Several small to medium size polygraph offices were forced out of business. The polygraph examiners, of those closed businesses, failed to renew their state polygraph licenses. The loss of this funding caused many state polygraph boards to close. The remaining licensed examiners renewal fees in some cases more than doubled in cost. Larry Wolford, the investigator for the Texas State Board of polygraph examiners, advised license renewal for 1990 had fallen from approximately 800 to 270 for the year. The loss of pre-employment testing had its greatest effect on the polygraph industry in the beginning, but as time passed the industry had signs of a rebirth. Robbie Bennett the president of the American Polygraph Association advised membership was up considerably

for 1991, with approximately 2000 members. The new "Act" changed the procedures in polygraph testing, but those examiners who worked to incorporate the changes found that business started to grow and come back. Some polygraph firms believe the industry needed to be cleaned out, one side effect of the "Act", those businesses which had shady reputation. Mr. Richard Wood, a polygraph examiner in Arlington Texas, on a positive note for EPPA, stated "he doesn't hear people sitting around downgrading the profession like it used to be". A positive image could help us out at this time.

The government and criminal polygraph examiners were unaffected by the implementation of EPPA. The only significant change realized was the increase in license renewal cost. It is rumored, however, all this is about to change in the near future. Legislation at the state level has been introduced to restricting some polygraph use. House Bill 261 prevents peace officers or attorneys for the state to ask a complaint in an assault or sexual offense to take a polygraph test. Other state legislation is Senate Bill 109 which prohibits employee discrimination of the Institutional Division at the Texas Department of Criminal Justice for refusing to take a polygraph examination. This regulation could become law as soon as September 1, 1991.

The Federal proponents of polygraph have indicated that new legislation will be introduced at the federal level which will inhibit the use of polygraph on disabled persons. This will be applied to the employment of new hires in a government job. Labor is sending a message to the polygraph industry, " We are not done with this matter yet".

VII. SUMMARY

How could a law such as EPPA ever get passed? Why do they attack something as useful as polygraph? These are common questions asked by examiners and employers across the country. It may not be that difficult to understand when one considers what has transpired in recent years. The polygraph industry has met with resistance from anti-polygraph activists since 1963. Employees complained to the unions continually with horrid stories about things they encountered during pre-employment and periodic tests. The larger powerful unions lobbied the Department of Labor with these complaints demanding somethings be done. It is completely irrelevant as to their authenticity, the damage was already done. The studies by the American Civil Liberties Union who stated "no person should be required, by moral or legal compulsion, to submit to a lie detector test". The fact that courts have determined the Bill of Rights, as a whole, constitute a right to privacy, and it is the combination of these rights also that is violated by the use of polygraph testing. A study by the Moss Commission concluded "There is no lie detector, neither machine nor human. People have been deceived by a myth that a metal box in the hands of a investigator can detect truth or falsehood". These type of findings were listened to by the lawmakers of our land. The

use of the so called "investigative" television reports put on by major networks depicting the accuracy by staging a theft. This "Theft" was committed by allowing one of three camera men to remove an object from a room. They in turn hired a unsuspecting polygraphist to find the thief, but before he was allowed to test, helpful hints were given directing the examiner to find the wrong person. It doesn't seem important however that test conducted in this manner have nothing to do with real polygraph testing. The role of the thief knows he has nothing to lose, because he was allowed to take the object. The fact that no psychological set or any theory is set in place to cause emotional response from this person. The public is exposed to these theatrics and form hardened opinions of polygraph. The case of John Woodland v. City of Houston 731 Fsupp 1304 alleging polygraph testing in the pre-employment exams were "unreasonably intrusive". This case was won in federal court by the plaintiff and resulted in a damaging injunction being placed on the Houston examiners.¹³ The reported news of one polygraph examiner in Louisiana running 40 to 50 tests in one day. Reasons like these, according to Bill Scheve past president of American Polygraph Association, coupled with the fact that in 1988 the majority of the House and Senate were liberal Democrats the "Act" became law. Senator Edward Kennedy, a chairman of the Labor and Human Resources Committee, had the right

information at the right time.

If you are waiting on polygraph testing to be 100 percent accurate, forget it. It will not happen. The Office of Technical Assessment was not able to develop adequate methods to measure the state of accuracy now present in modern day polygraph testing

If one truly examines the Employee Polygraph Protection Act of 1988, the legislators are giving us a message. They feel polygraph testing is still a valuable tool if used in conjunction with other investigative efforts. They, on the other hand, are not going to allow the polygraph profession to continue in a state of disarray, such as poorly regulated state enforcement, and examiners who toy with the idea of a "get rich quick " scheme. The price you have paid for their help in this matter is the loss of pre-employment testing.

The future of polygraph is in the hands of our present polygraph examiners. If the profession is to continue, each examiner needs to do his or her part in promoting the profession to the highest degree of integrity. That means doing the job with the utmost ability, attend all related schools to further your knowledge or skills, and join professional organization to stay abreast of new innovations.

At present we will live with EPPA, but hopefully with hard work and a change to a majority of conservative

Republicans in the House and Senate it may be possible to pass legislature which could relax some of the current Federal regulations.

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