

Contribution to the Knowledge of the Effect of Cocaine

(“Beitrag zur Kenntniss der Cocawirkung”)

Dr. Sigmund Freud, published June 1885

Marek J. Drużdżel

Politechnika Białostocka
Wydział Informatyki

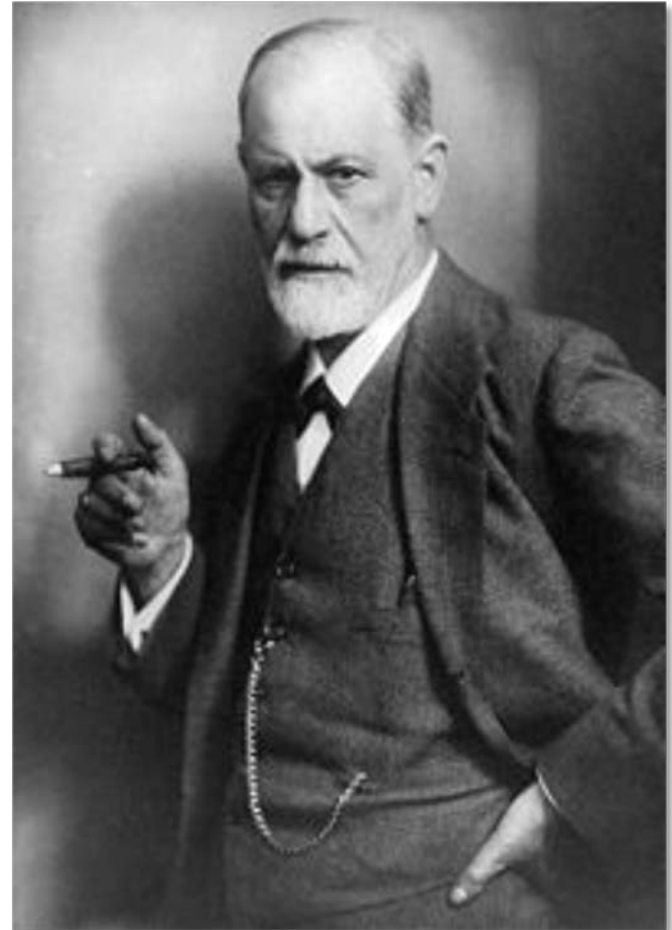
m.druzdzel@pb.edu.pl

<http://www.wi.pb.edu.pl/~druzdzel/>

Overview

- **Background**
- **Experiments**
- **Problems with validity of the results**
- **Lapses in ethical practices**

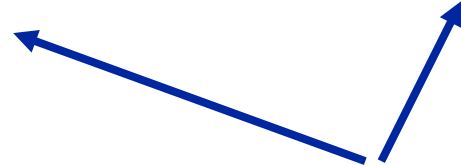
This paper belongs to so called “Cocaine Papers” of Freud, carefully removed from his collected works but dug up by those critical of Freud



19th Century Science

- ◇ 1869 Dmitri Mendeleev's periodic table
- ◇ 1873 James Clerk Maxwell's theory of electromagnetism
- ◇ 1879 First psychology laboratory (Lipzig, Germany)
- ◇ 1883 First American psychology laboratory (Lipzig, Germany)
- ◇ 1885 Freud's cocaine experiment publication
- ◇ 1886 First doctorate in psychology
- ◇ 1888 First professor of psychology
- ◇ 1895 Wilhelm Conrad Röntgen discovers x-rays
- ◇ 1896 Freud gives up cocaine

Coca leaves, coca tea, coca cola, cocaine



Cocaine in Europe

- Cocaine was brought to Europe in 1749, and first appeared in Lamarck's botanical encyclopedia in 1786 under the name of *Erythroxlon Coca*.
- Interest was reawakened in 1859, when an Italian physician named Paolo Mantegazza extensively publicized the plant and its medical benefits.
- Professor Schroff of Vienna and Anrep of Würzburg, both started experimentation on this new drug.
- Freud's involvement with cocaine research started in 1884.

Freud's involvement with cocaine

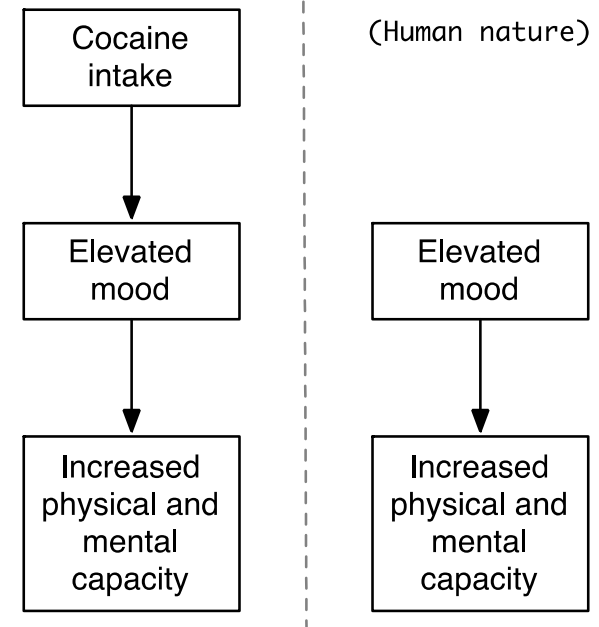
- In 1884 Freud was one of the many ambitious young researchers in Vienna looking to further his career with the help of an interesting breakthrough in research. The biggest drive in his life at the time was the pursuit of his marriage plans to **Martha Bernays** as soon as he could afford it. At the time he was still only a house officer at the **General Hospital of Vienna**.
- It was at this time that he read a paper written by a German Army surgeon named **Theodor Aschenbrandt**, reporting his experiences with cocaine. Aschenbrandt has been a follower of **Von Anrep**. Both researchers however, were unsuccessful in carrying out their respective research on human subjects due to a lack thereof.
- Freud ordered some of this drug from the house of **Merck**. It all began with his testing about a twentieth gram on himself , that changed his bad mood into a cheerful one.

Freud's involvement with cocaine

- He immediately distributed this new drug on a wide scale among family and friends, convincing them of its miraculous effects on human health. He advised it to one, as a gastric anesthetic and to another as an anti-depressant. In a short time, he too began consuming this “magical drug” on a regular basis against depression and indigestion. As (Jones 1953), wrote, “looked at from the vantage point of our present knowledge, Freud was rapidly becoming a public menace”.
- A number of these papers were the result of his own self-experimentation of the drug in various forms at various times. He would take the alkaloid orally and after a measured lapse of time, would conduct experiments on muscular strength, fatigue and so on, (measured by a dynamometer). Another major flaw of this method was the fact that he was carrying out these experiments himself, hence introducing a bias effect in the results.

Freud's experiment

- To investigate objectively and measure quantitatively the general effect due to mood elevation (due to cocaine intake)
- To determine increase in physical and mental capacity and endurance
- Freud recognizes that effect of cocaine vary for different people: euphoria, confusion, toxic and uncomfortable feeling



Freud's experiment

- Investigation of “motor power of certain muscle groups and psychic reaction time”
- Two dynamometers – one-handed and two-handed device
- One neuroamoebimeter



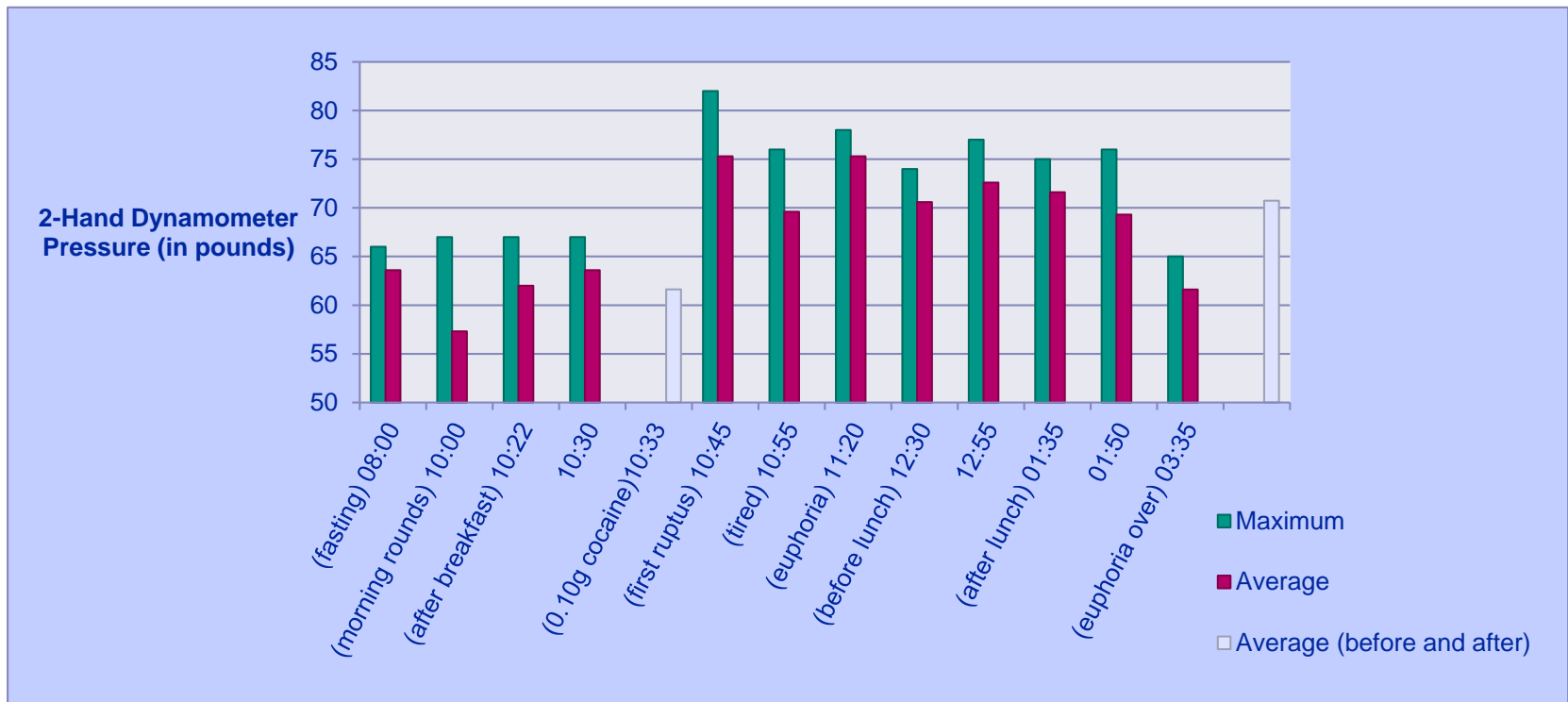
Freud's experiment

- He was both the subject and the observer
- 0.05-0.10g cocaine per intake (0.2-0.4g average starting dose for a “hit” for drug users)

“I realize such self-observation have the shortcomings due the person engaged in conducting them, of claiming two sorts of objectivity for the same thing. I had to proceed in this manner for reasons beyond my control and because none of the subject at my disposal has such a regular reaction to cocaine”

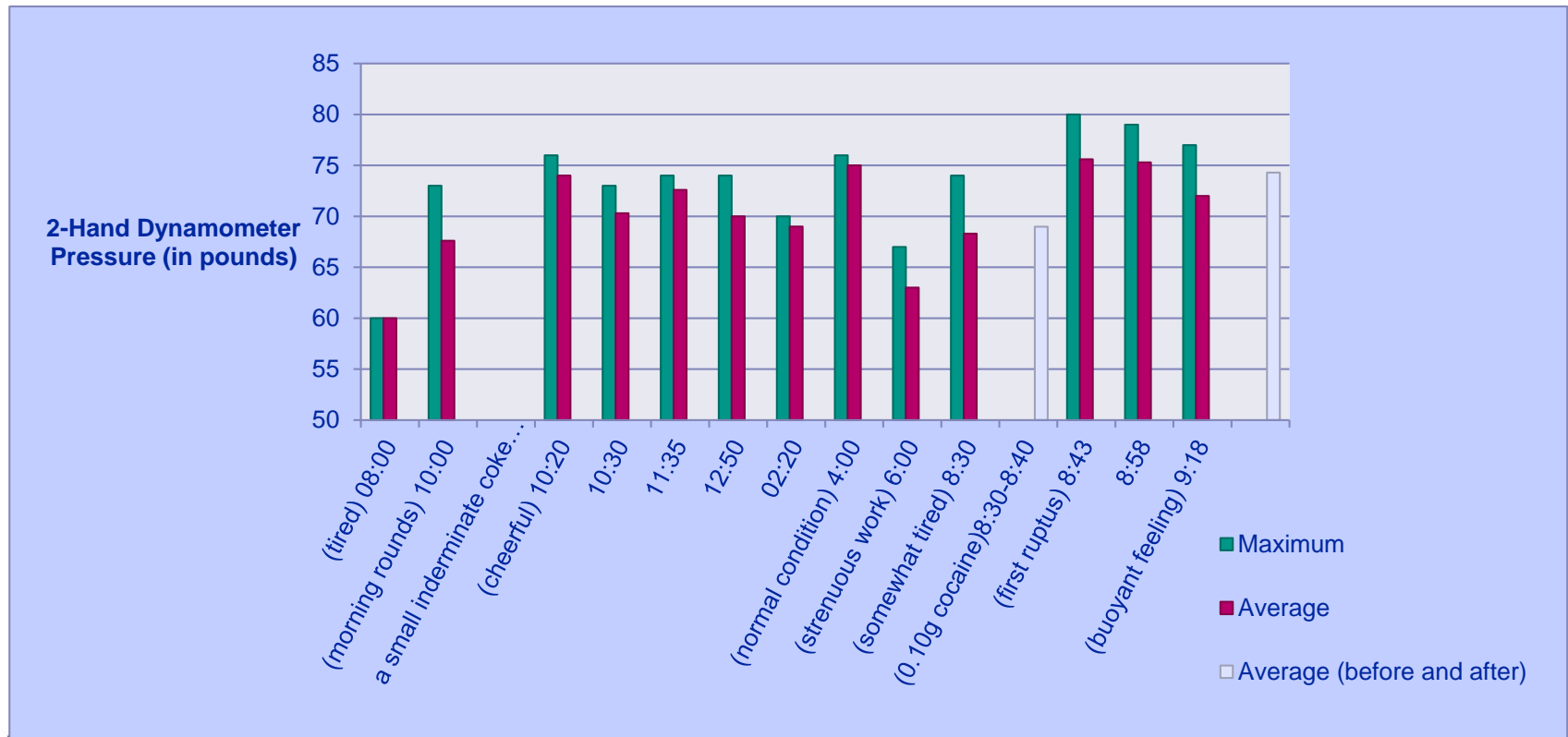
Experiment 1, Nov 9th 1884

- Dynamometer with 2 hands
- Maximum action of cocaine began ten to fifteen minutes after intake and remained in (lesser) effect for number of hours.



Experiment 2, Nov 10th 1884

- Dynamometer with 2 hands
- This second experiment is to demonstrate the action of cocaine in the case of higher starting figures for motor power



Control experiment

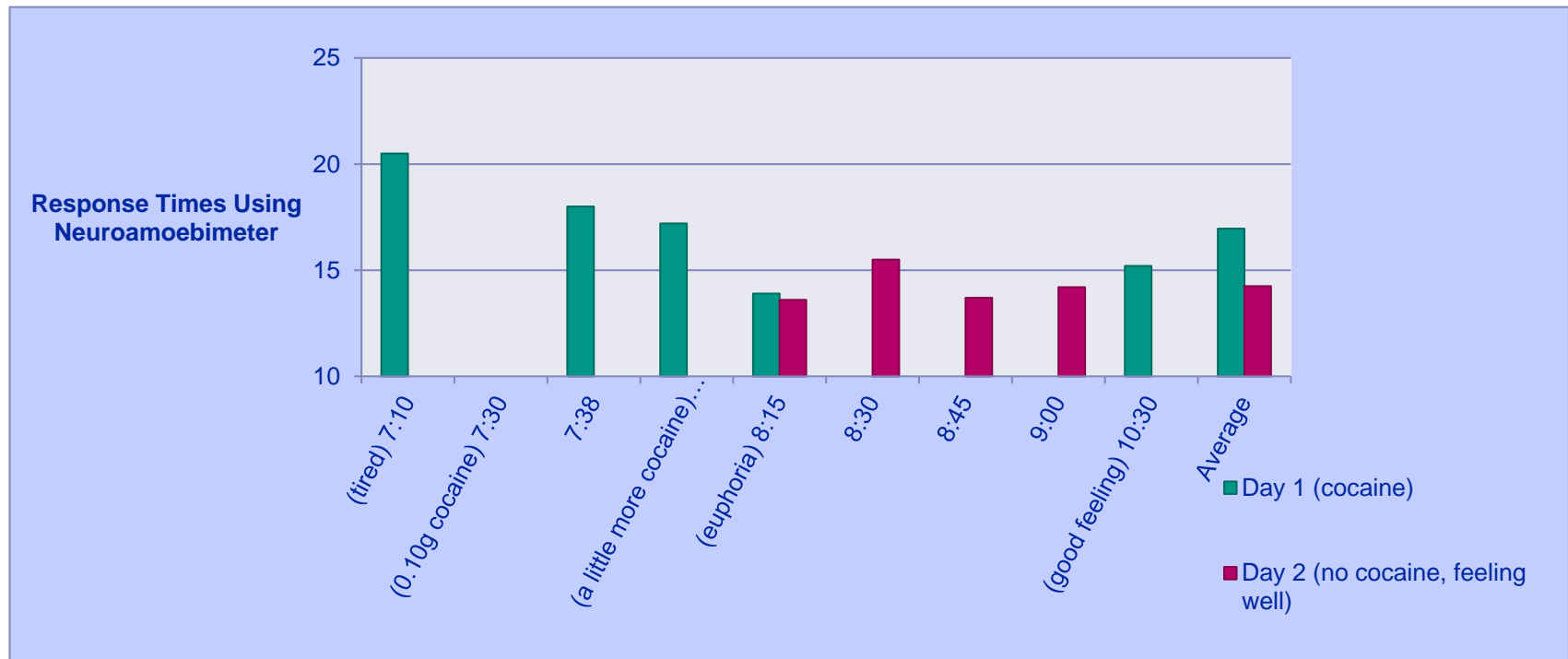
- Freud attempted to do control experiment by measuring motor power on two different days when he did not use cocaine
- However,
 - He used different one handed dynamometer
 - The second dynamometer had different scale and measured pressure in kilograms, not pounds

Freud's conclusions

- **Motor energy of a muscle group reveal a regular fluctuation in the course of a day**
- **The same figures reach quite different absolute values on different days. For himself, Freud measured maximum difference of 6kg and 4kg.**
- **By comparing values obtained by the four experiments (two with cocaine and two control), Freud concluded that:**
 - **Motor power seems to function of mood**
 - **Cocaine has no direct effect on motor power, but instead increases mood, and therefore increases motor power**

Response time experiment

- Freud concluded that under cocaine his reaction times were shorter and more uniform then before taking the drug
- However, on days he was feeling well his reaction times were “just as good”



Internal validity?

- **History** – measurement were taken on different days, so history can influence the results
- **Maturation** – Freud himself states that fatigues introduced error in his measurement
- **Testing** – As observer and a subject at the same time
- **Instrumentation** – He used two different devices

Internal validity?

- **Statistical regression** – Freud selected himself because “regular reaction to cocaine”
- **Selection** – same as above
- **Experimental mortality** – does not apply
- **Selection-maturation interaction** – Freud cannot determine for certain what effect does cocaine have on motor energy
- **Experimenter bias** – Absolutely

Freud's own experiences with cocaine

- **The initial feelings of exhilaration and euphoria.**
- **Long lasting intensive mental and physical work could be performed without fatigue**
- **The need for food and sleep were completely banished.**
 - **A meal though eaten without revulsion, was clearly felt to be superfluous under the effects of cocaine.**
 - **During the first hours of the coca effect, it was not possible to sleep, but that was in no way distressing.**
- **From his initial stand of cocaine as a stimulant, especially useful in situations such as mountaineering, war conditions, etc.**

Freud's cocaine applications

- **Diabetes**
- **Seasickness**
- **Stimulant (mountaineering, war, etc.)**
- **Psychiatric cases**
- **Various gastric and intestinal disorders**
- **Syphilis**
- **Aphrodisiac**
- **“Antidote” to morphine addiction (von Fleisch-Marxow's case)**

Freud's experimentation with cocaine

- He was also recommending this drug for everything from diabetes, seasickness, gastric and intestinal disorders, cachexia (which is a state of general ill health and malnutrition) to mental illnesses such as neurasthenia.
- Unfortunately he was unable to localize the only true use of cocaine in the field of medicine, which is that of a local-anesthetic- which was made by a fellow-researcher named Koller. Freud tried to side line the fact of cocaine being a good local-anesthetic for a long time, until finally he himself admitted that his laziness was in fact the cause of this omission.
- However, the ill-effects and addictive nature of this drug were realized later with the death of noted researchers who were addicted to this life-saving discovery. Freud's claim ended in 1887 when he admitted that, "on more than one occasion, an aversion to the drug existed which was sufficient for curtailing its use".

Freud's lapses with ethical research practices

- **1884** Sporadic and scientifically uncontrolled research was carried out. A lot of these experiments were carried out and controlled by him using himself as the subject. Knowing what he was looking for, made it somewhat easier for him to produce the results 😊.
- **1884** Prescription of the drug to family and friends without sufficient testing.
- **1884** Deficiencies in his paper “Uber Coca”. Although the review of the previous literature is comprehensive and appears accurate, the remainder of the paper is vague and disorganized.
- No information is given on the number of subjects employed.
- No information is given on the dosages employed.

Freud's lapses with ethical research practices

- No information on the duration of treatment.
- Beyond a brief mention of the variations in pulse rate, Freud omits reference to other important measurements such as blood pressure readings, temperature recordings, etc.
- In the section listing the effects of the drugs, he bounces back and forth between his own subjects and those reported in the previous literature in a disorganized manner.
- **1885** Knowing very well that his friend Fleischl-Marxow was taking large doses of cocaine when he was supposed to have ceased its use, Freud read a paper at the Physiological Club and two days later at the Psychiatric Society, in which he described what must certainly have been Fleischl-Marxow case as one of, “ rapid withdrawal from morphine under cocaine”.He claimed that no cocaine habituation had set in.

Freud's lapses with ethical research practices

- **1885** This paper was published in the *Medicinisch-chirurgisches Centrablatt* on August 7, 1885. Between the original delivery and the publication, Fleischl's case deteriorated still further. He had begun to exhibit classic symptoms of severe cocaine intoxication - attacks of fainting, convulsions, insomnia, and behavioral eccentricities. Despite that, Freud allowed the 1885 paper to go forward for publication in August.
- It was only much later when the world became aware of the true ills of cocaine addiction, that Freud finally admitted to the addictive nature of cocaine which could lead to a vast multitude of problems, when subcutaneously injected, as opposed to taken orally, which again was recommended by him at the 1885 readings.

Concluding Remarks

- Freud's experience is a classic case of a well known research scientist being involved in experimentation primarily for the purposes of achieving a set predefined outcome, irrespective of the costs or methods involved in the process.
- Apart from the medical malpractice of recommending the substance to any and every human being for various reasons, he was also responsible for unsubstantiated experimentation outcome for which he could have been largely penalized.
- It is situations like these that arise from a desperate need at times, to achieve certain goals, for totally unrelated reasons, for example his urge to be married as soon as possible to his fiancée which could have lead to a haphazard experimentation process on his part.

