Abstract: Awareness of a person's own action is strongly related to a person's conscience. An unscrupulous being blocks off his awareness and does not care about the consequence of his doing. Such a person is an autocrat. He is hyposensitize. His ego is inflated. On the contrary, a person of excessive awareness, of too much forbearance, can become timorous. He is hypersensitive. His ego is depressed. The autocrat with his oversized ego sets off toward his goal with uninfluenceable direction and reaches his goal well, even overshoots it easily if nothing hinders him. The forbearing person, the hypersensitive, operates leniently and, as a result, achieves only part of his desired or deserved aim. A person who is under-sensitive, or who blocks off awareness, can exert a will which is many times larger than the will a lenient person can exert before they become unstable and, then, no longer being able to strive toward their goal. These facts are demonstrated with a very basic circular cause-effect-cause model. The mathematics to describe the model's behaviour is elementary.

Keywords: International Stability, human behaviour, bio cybernetics.
But such behaviour involves danger. Firstly, there is the possibility that the person becomes unstable within himself and loses the capability to strive toward his goal. This happens when he wants to exert too much will.

His greed for will can become such that he ruins the chances of success. Secondly, with too much exerted power it is easy to overshoot the mark with the consequence that the environment opposes to the bold action when the inflated person’s daring behaviour becomes recognized. This is the case when revolt is setting in.

A very simple functional model verifies the operation of the feedback signal, i.e., the awareness, and the consequences by hindering the perception of this signal or by not being able to sense it.

The same model serves to describe the outcome when a person’s awareness is excessive. Sensitivity can be so overwhelming that the person cannot act anymore with his full capacity. The goal then cannot be reached anymore to its best extent. The person might even collapse, e.g., in despondency or depression.

2. THE DESCRIPTION OF THE MODEL

Fig. 1 depicts the basic structure of an individual’s functioning in regard to the notions to be investigated. It is a feedback-loop producing self-control which, in turn, provides awareness. Self-control, or awareness, is caused via the feedback signal. This signal also can be called eigen-response based on responsibility. The purpose of the loop’s configuration is to reach the goal despite the entering disturbance (or disturbances) from the environment with which the person is related to (exogenous) or from disturbances coming from inside the person himself (endogenous).

The goal \( u \) can be called self-realization, because whatever a being does, the action always is in regard of the realization of the person himself: *Proximus sum egomet mihi*, I am myself the next.

In order to approach the goal \( u \) a will is necessary. This will is indicated with the symbol \( G \). As every action to be executed needs time, an element describing the time-dependency of acting is incorporated. This is the transfer function \( F_t \). More about this function later.

The feedback signal \([- F_b x(t)\] compares continuously the currently reached goal attainment \( x(t) \) with the desired goal \( u \). The difference, that is what is not achieved yet, is named \( \varepsilon(t) \). \( \varepsilon \)-stands here for "error"; it is expressed in equation (1). The person’s intention is to make the error \( \varepsilon \) as small as possible in order to come to his goal \( u \) as close as possible. For this operation he needs his will \( G \).

\[
\varepsilon(t) = u - F_b * x(t).
\]

In equation (1) it is assumed that the goal \( u \) does not change as a function of time. The goal self-realization \( u(t) \), does not show time dependency \( u(t) \), it is just \( u \). For easier reading, the notation of time, \( t \) for \( x(t) \) and \( \varepsilon(t) \), will not be carried along - although time dependency exists because the process goes on in time. It functions over time. Thus, equation (1) becomes a simpler notation, equation (2):

\[
\varepsilon = u - F_b * x
\]

The term \( F_b \), the transfer function of \( x \), is a factor. It determines the magnitude of the feedback signal \( x \). \( F_b \) can make \( x \) smaller or larger before it becomes compared with the goal \( u \). In other words, the error \( F \)-within a person depends upon his awareness.

The loop, that is the entire person, becomes disturbed mainly via the environment the person lives in.
(exogenous disturbance). The disturbance signal is called \( d(t) \), or also simply \( d \). For simplicity, \( d \) is considered to be constant and - also for simplicity - of equal magnitude as the goal \( u \). (Indeed, \( d \) can be smaller or larger than \( u \).) This disturbance \( d \) becomes positive or negative depending on the effect it has on the person. A positive effect upon the signal \( d \) means help; or an addition to the distance on the way to the goal \( u \); whereas a negative effect subtracts from the effort toward the goal. A negative \( d \)-effect pushes \( x \) further back on the way to its goal.

In order to attain the goal \( u \) as accurately as possible, the feedback signal \(-F_b x\) must be \(-x\), i.e., \( F_b \) must be \(+1\). This fact will be shown in Fig. 2. (There are other means in the human being to approach \( u \) faster than with the time delay \( F_t \) alone - this is derivative action - called anticipation \( \varepsilon(\tau)/dt \), but this feature is not considered herein; the focus is on the awareness factor \( F_b \) only.)

To begin with, the time factor \( F_t \) is disregarded. In other words, \( F_t \) is put to \(+1\). The transfer of the power \( G \) through \( F_b \) is, therefore, instantaneous and unchanged. Later, a time-delay will be incorporated for a somewhat more sophisticated - and more realistic view, for the dynamics of the loop, i.e., for its time dependency. To put \( F_t \) equal to \(+1\) is equal to the end-state of an action which was processed through the loop. It is the final attainment after a goal \( u \) was set. It is the steady state.

The purpose of the loop in its total value comes to light when it is expressed mathematically and represented graphically. Then it becomes intelligible. This representation follows. (Because the human brain can perceive only situations which happen immediately, at the instant, because it cannot perceive continuous circular functioning of cause effect cause behaviour, it is the mathematical representation which gives insight into the time-functional action.)

3. THE MATHEMATICS OF THE LOOP

The description of Fig. 1 is the following. At every instant when action is in process, the momentary attainment \( x \) is composed of everything which comes - pictorially spoken - "vertically down" in Fig. 1. This \( x \) is composed of three parts:

\[
\begin{align*}
x_1 &= GF_c U_c u \\
x_2 &= \pm U_c d \\
x_3 &= -F_b GF_c U_c x
\end{align*}
\]

thus,

\[
x = x_1 + x_2 + x_3
\]

Rearranged, \( x \) becomes equation (3):

\[
x = \frac{GF_c U_c u \pm U_c d - F_b GF_c U_c x}{1 + F_b GF_c U_c} \quad (3)
\]

Equation (3) says that the goal attainment \( x \) is a function of the desired goal \( u \), the influence of the disturbance signal \( d \), and of all the bits and pieces of the loop, that is \( F_b, G, F_t, U_c \), and the summing points \( \Sigma 1 \) and \( \Sigma 2 \). The attainment \( x \) is a composition of two parts, of the goal \( u \) and the disturbance \( d \).

It is advantageous to consider first the two parts, \( x_u \) and \( x_d \), separately; \( x_u \) when \( d \) is zero, and \( x_d \) when \( u \) is zero.

The signal \( u \) is always positive for the person himself. The goal \( u \) is what a being wants to attain. Therefore, \( u \) shall be \(+1\), or 100%; without any ethical value! (Ethics is a subjective term which depends on attitude, culture and religion. Nature has no ethics.)

The signal \( d \) is more critical. Its effect can be positive, (+1), or negative (-1), or any value between (+1) and (-1) - or even larger than \( \pm 1 \). If the effect \( d \) has on the goal striving process is negative, \( d \) is to be taken negatively.

First, \( d \) is set aside by putting \( d = 0 \) in equation (3). Thus, equation (3) becomes equation (4), our first concern. \( F_t \) in a steady state position is set to \(+1\). And also \( U_c \) will be set to \(+1\), because it is not a parameter of interest.

\[
x_u = \frac{G}{1 + F_b G} u \quad (4)
\]

This equation (4) is the expression which is to be investigated in order to explain the essay's meaning.

4. THE INVESTIGATION

4.1 NORMAL SITUATION

In normal situations, in biological and technical operations, \( F_b \) is equal to \(+1\). Then the negative feedback \( x \) is a correct measure of the momentary attainment. With this condition, equation (4) changes into equation (5). In this equation the goal \( u \) is put to \(+1\), or 100%.

\[
x_u = \frac{G}{1 + G} \quad (5)
\]

In Fig. 2, curve A demonstrates this extremely important expression (5).
a) The curve A tells that the higher the will $G$ is, the higher is the attainment $x_u$; but the curve $x_u$ as a function of $G$ is by no means a straight line. The final attainment $x_u$ is not proportional to the will $G$.

b) With $G = 1$, the attainment $x_u$ is 50%. With four times this will, with $G = 4$, $x_u$ is only 80% and not 4 times the attainment of $G = 1$.

c) With increasing $G$, the curve flattens out. The higher the reached attainment $x_u$ is, the more will $G$ is needed for an additional increment of $x_u$. This fact is a natural law every sportsman and musician knows well. The higher one is up the ladder of success, the harder it is to achieve a further improvement, a further increment $\Delta x_u$.

d) It is impossible to attain 100% of $u$, of what one is striving to. In order to attain 100% goal, the necessary will $G$ would have to be infinitely large. (Infinity - by the way - cannot be perceived, not even imagined, with our brain! The two words, infinity and eternity, should not be used in science, except as abstract term in mathematics.)

It is the feedback signal $-x$ which flattens the curve. But why is feedback so important? It is needed to fight the influence of disturbances $d$, if disturbances occur; and they are always around. What is a disturbance's influence? Let's take the formula (3), but with $F_t = 1$ and $F_b = 1$, and make it equation (6).

$$x = \frac{G}{1 + G} u \pm \frac{1}{1 + G} d$$  \hspace{1cm} (6)

With $u = 1$, and $d$ also +1 formula (6) becomes formula (7).

$$x = \frac{G}{1 + G} \pm \frac{1}{1 + G}$$  \hspace{1cm} (7)

It can be seen that the two parts, when added together with a positive influence of the disturbance, become +1.

$$x_u + x_d = +1 \text{ or } 100\%$$  \hspace{1cm} (8)

The effect of a positive, of a helping disturbance $d$, is such that the sum of $x_u$ and $x_d$ is together just 100% (This implies that $x_u$ and $x_d$ have the same effect and equal magnitudes). The dimension of $d$, and the dimension of the influence which $d$ has on the person, must not be the same. It is the effect the disturbance $d$ has what counts. The negative $d$-effect damages the self-realization $x$. This damage has the opposite effect than $x_u$. And vice versa: the positive effect of $d$ increases the goal attainment. But in both cases, the higher the will $G$ is, the larger $x_u$ becomes and the smaller is the influence $d$ has on $x_u$. In the expression of $x_d$, in equation (6) the factor $G$ is only in the denominator. $G$ “pulls” the influence of $d$ down, makes it smaller.

Without any will ($G = 0$), the influence of the disturbance $d$ is +1 00%. $x_u$ becomes equal to $x_d$! The disturbance comes fully through, nothing of the wanted self-realization $u$ will be attained. The rule is: no will $G$, no gain $x_u$, **Ex nihilo nihil fit** - Nothing comes from nothirig. Self-will is necessary for self-realization! And self-realization means to exist.

For example, with a will factor $G$ of 9 the attainment $x_u$ is 90%, and a positive influence of $d$, $+x_d$, is only 10%. Both together, $x_u + x_d$, make 100%. In Fig. 2 the curve $x_d$, which is

$$x_d = \pm \frac{1}{1 + G}$$
is marked with D. At weak will $G = 1$, $x_u + x_d = +50\%$, and $x_u - x_d = 100\%$. But with $-x_d$, $x_u - x_d$ becomes 0. Life is such that $x_d$ is mainly negative! Therefore, the curve marked with $x_u - x_d$ in Fig. 2 is definitely domineering.

4.2

Our main interest is now the following: What is the goal attainment when the feedback signal $x$ becomes smaller or larger in its amplitude, i.e., when the factor $F_b$ becomes smaller or larger than $+1$? With $F_t = 1$, formula (3) becomes formula (9).

The parameter $F_b$ is now the important variable. It shall be made, firstly, smaller than 1, say 0.5. The feedback signal $F_b$, which tells how much of $x$ has already been achieved, becomes obstructed. Only half of it comes back. The awareness of what the person is doing (for his own self-realization, indeed) becomes reduced. The response, or the responsibility is only 50%. The autocrat does not want to realize or cannot realize fully what his attainment really is, i.e., what he is doing. He just wants to exert his will $G$ in somewhat uncontrolled action. With $F_b = 0.5$, equation (10) becomes equation (11).

$$x_u = \frac{2G}{2 + G}$$

Fig. 3 depicts the goal attainment $x_u$ for this situation. It is the curve B. For comparison, the curve A of Fig. 2 is incorporated. The goal attainment $x_u$ of B becomes larger than $x_u$ of A. For $G = 1$ it is now 67% instead of 50% as it is in Fig. 2, and for $G = 4$, $x$ becomes 133%, and no longer only 80%. The person can easily overshoot his goal! With a will $G = 2$, 100% of the goal is already attained. The absolute maximum which can be attained (with $G = "0"$) is 200%. Curves A ($x_u$ and $\pm x_d$) are for a "normal" person of $F_b = 1$; curves B are for an autocratic person of $F_b = 0.5$, and curves C are for an oversensitive person of $F_b = 2$. The explanation for B 2 follows.

The interpretation is: Reduced, faint, perception of $x_u$, of the doing, or denied awareness, increases goal attainment far above 100%. The egoist can overshoot the mark. Disregard self-control, disregard what you do and your achievement goes marvellously up! This is the way power hungry people act. They don't care what they do. They do: period. And very so often, they can become corrupt. An autocrat generally is a despot. **Toute grandeur est dans l’assaut;** Platon.

What is now the problem concerning the effect of disturbances? The effect of $d$ on $x$ is as equation (12) indicates.

$$x_d = \pm \frac{2}{2 + G}$$

The effect of $d$ on $x$ becomes almost doubled compared with the case for $F_b = 1$. $x_u$ also is about twice the amount compared to the situation when $F_b = 1$, i.e., at normal sensitivity. Being insensitive brings goal attainment, but also higher effect of disturbance. In the social world the benefit for exerting bold power...
is double-edged; disturbances which work against the execution of will very often occur.

What now, if the contrary happens: hypersensitiveness instead of hypo sensitiveness?

For a person who is hypersensitive, \( F_b = 2 \) shall be taken. Then formula (9) becomes equation (13).

\[
x = \frac{G}{1+2G} u \pm \frac{1}{1+2G} d
\]  

(13)

Again, looking at \( x_u \) only, and with \( u = 1 \), the expression (14) occurs.

\[
x_u = \frac{G}{1+2G}
\]

(14)

The goal attainment \( x_u \) of the hypersensitive person is shown in Fig. 3 as curve C. The maximum attainment, i.e., at very high will, is only 50% of \( u \). Too much sensitiveness is detrimental to self-realization.

If a disturbance \( d \) becomes involved as - say a psychiatrist who wants to help - the patient takes only half of the therapist's signals. The help \( d \) is divided by about 2G and not only by \( G \) as in Fig. 2. A person suffering from depression - because he is oversensitive -, does not promise much success for "curing" - unless he is capable to reduce his awareness, to be able to become less mindful. Otherwise the goal to achieve remains an unattainable wish.

All three curves, A, B, and C, are common in that they start at \( G = 0 \). When there is no will for one's realization, the disturbance takes control and does it for the disturbed person by 100%! A hint to drug addicts where the negative effect of \( d \) has its say, (-\( x_d \))!

The ratio, disturbance \( \pm x_d \) divided by \( x_u \), is for all three cases the same, namely \( \pm VG \). All three kinds of persons suffer (or benefit in case of a \( + x_d \)) the same proportion for the same \( G \). It seems that this might be a nature's axiom. No being shall sacrifice more attainment due to a disturbance, whether it is bold or gentle. (This statement has to be reconsidered further down.)

One is tempted to allocate the person with the characteristic B to a dastardly dictator, and the person with the characteristic C to a highly introvert "noli me tangere" being. A dictator's behaviour with a feedback signal even smaller than 0.5 might be an outrageous tyrant, an introvert with a feedback transfer factor of larger than 2 might be a psychopathic patient with endogenous depression.

In social interaction with other people, boldness as well as timidity, both can have a positive effect as well as a negative one. It depends on how an individual senses the influence coming from interaction. But interaction with a second person, which is a matter of bilateral information exchange, is not considered herein.

But our opus is not finished here.

5. CONCLUSION

This extremely simple model already demonstrates social behaviour of remarkable importance.

Of the three definitions taken from the Webster's Dictionary, the one which says response following an action" is definitely related to the awareness of what one is doing (b). But the other two, (a) and (c), fit perfectly the model Fig. 1 as well.

Without feedback, the output \( x \) depends fully on the will. And when this case is applicable, history is ready to present innumerable samples: Caesar, Nero, Hannibal, Popes, Napoleon, Stalin, Hitler, but also founders of religions. - And if a butcher would feel what he does to mother cow when he kills her baby to make sausages of its flesh, his \( F_b \) would be considerably larger than 1. To fulfil the daily butcher's slaughter quota, his professional \( F_b \) must be zero.

It can be said that if we recognized what we do to our fellow man (and woman) and all other creatures, we could dislike our own self. From this standpoint it would be justified to call somebody who's \( F_b \) much larger than 1 not only as timid, but rather as insane. In order to live, killing life is compulsory - therefore a \( F_b \) of 1 or somewhat smaller than 1 is necessary for survival. Surviving means killing, done in need for food, for self-defence, or for the plain reason of aggressive disposition.

Although the model Fig. 1 is of utmost simplicity, the circumstances already become rather involved. This little essay is a hint to feel that behind our "reality" is hidden an enormous functional complexity.

Referring to the scope of this conference, I dare to say, is Mathematical Modelling and Investigating of Beings and Their Social Interactions - in a time-functional sense.

REFERENCES