

# Science as Profession 80 Years after Max Weber's Lecture

by

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**Prof. Dr. Adolf Ebel for his 65<sup>th</sup> Anniversary**

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## **Abstract**

The author neither develops a (new) theory of science nor a new theory of work, but only reports about ways of thinking and wants to show with it how necessary these theory (theories) would be. If there is not another clearer, but particularly less arbitrary understanding of science and work soon, the international community of scientists will have to reckon with even more unemployment and insignificance. Then the Germans have to say good-bye to the almost 200 years old (German) Humboldt's ideal of „human formation (accomplishment) by means of science“, to which the German universities are still obliged today. In order to counteract this trend it is necessary today to consciously „create knowledge“ in a (synergetic) between of profession and vocation.

For the author - 80 years after Max Weber's lecture –**(empirically based) Science contributes to a better way of seeing oneself in relation to the cosmos, complementary to the transcendence, enables technical and technological developments, and it is for the scientists a pretentious possibility of self-representation.**

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## 1 Preface

In 1917 Max Weber who was invited by the Association of Free Students gave the lecture “Science as Profession“ in Munich, which was then published in 1919, one year before his death. The difficulty in understanding this lecture correctly nowadays already starts with the title, because at that time the German word profession was still fully alive in its double meaning, for which there are two different translations in the dictionaries of other languages, for example, English *profession or vocation / a calling*, French *profession or vocation* - similar in Italian and Spanish. Today the German word predominantly is common only in the sense of the special activity that serves for earning one’s living. Its former meaning, which means personal vocation for a task, that requires total devotion and promises fulfillment for it, is hardly understandable today. (The new [thought] domain of „psychology of destiny“, however, as it is for example represented by James Hillman, demands from us to rediscover our uniqueness and thus also our vocation in order to remain healthy mentally and physically.) The students who invited Weber to the lecture did not expect a careers guidance or a profession sociology, they rather wanted to know what the science makes to an inner vocation and task to which one can or should completely devote oneself. At that time one still was in agreement on the fact that life does not achieve its sense from pleasure and convenience, but alone from work in the profession. Some of these ideas from the twenties today are more efficient in public than the newer knowledge from the last three decades. This is due to the inevitable time delay (time constant), with which scientific findings penetrate into the collective consciousness and can be put into practice. In this context, the increasing acceleration of the (labor) processes and their increasing differentiation play an important „intensifying role“. However, another fundamental problem has to be considered, namely the fact that knowledge can be accumulated, but not human life time. For this reason, the enormous growth of „potential“ (primary) information forces us in spite of or partly even because of the great progress of the computer technology more and more to an extremely quick „qualifying filtering“ of this primary information in order to gain the understandable, current (compressed secondary) information from this. Until now on average the time needed for this filtering process with the growth of the primary data continues to increase and thus enlarges the above mentioned (reaction) time constant.

These facts and the political power factor of the “disposal knowledge“ supplied by different kinds of science - today it has pushed the striving for new findings and knowledge into the background - have led to the current situation in which the way of looking at science is

predominantly characterized by a subconscious mixture of both „opinions towards profession“, particularly also by Max Weber’s idea of **science as self-contemplation**. However, since the end of the cold war and as a consequence of the increased disarmament efforts as well as the many „overkill-possibilities“ by means of already existing atomic, biological and chemical weapons, the special role of science (and technology) - particularly as guarantor for (new) disposal knowledge which causes more power - has strongly decreased and science is like any other profession increasingly subjected to the laws of the labor market and thus is more determined by short-term, free market targets than by cultural or longer-term political targets. Therefore it becomes more and more easy, especially for incompetent and dirigiste bureaucrats to demonstrate (sometimes delightfully) the scientists (who partly overestimate themselves) their powerlessness. Thus, more and more frequently scientists have to and are supposed to do somebody’s **„supplying work“ instead of cooperative work** (which is determined by bureaucratic objectives) - in the sense of employees of a subordinate authority, almost as pure suppliers of an industrial company, instead of free-market effective, **synergetic cooperation** between science and administration in its original sense. These problems are essentially enlarged by the constantly increasing number of laws and regulations which not only more and more restrict the necessary discretionary powers of the administrators (of the „healthy“ administrators), but in addition to that contribute to an increasing fear of taking decisions. Consequently, there are always new and additional time delays which make the implementation of new (particularly middle-class) projects that create jobs more and more difficult - often even impossible. Unfortunately, it seems that until now only some more thoughtful, directly concerned scientists and engineers have become aware of the fact that the German neologism **„Zuarbeit“** (= „supplying work“) can be a synonym for **„innovation murder“**. The same applies to the fact that the increasing bureaucratization - in the public as well as in the private sector - will harm the „location Germany“ more in the longer term and mostly in an indirect way than directly the incidental wage costs which are too high at the moment. In this context, Günter Ogger writes in his new book „Creaming off and clearing out“, Droemersch Verlag, München, 1998: „The civil service regulates us to death“.

The prospects for the science as an accepted culture factor will only get better and clearer to such an extent to which our understanding of that what we understand by science and work again becomes clearer, more conscious and less arbitrary. How unclear our current understanding of work is, is to be shown in the following.

## 2 Introduction

Nowadays in public and in most sciences work above all is considered as an economic factor and basis of social security. With the constantly rising unemployment it now becomes an increasing political problem. In principle, as a concept it has got a similar history in most of the cultures. There work has always been distinguished from a multitude of other human activities, for example, from playing and leisure - it should not be confused with idleness -, from the most different rites and cultic activities as well as from unusual capabilities and talents (charismas). In all cultures they needed “consecrations“ (“initializations“) or formal solemnities. They included all “free arts“ and “sciences“, also the jurisprudence, the knighthood and the ruling authority. In these “real“ professions, which had to follow personal vocations, generally a lot was achieved, but one did not work in the usual sense. One had to teach and learn a lot of things, but these „professions“ could not be taught and learned in the sense of the contemporary training and education.

**“Work ennobles“** was the slogan with which the 19th century raised the profession to a moral duty in the service of the self-liberation of humanity. The enemy ideologies of socialism and liberalism were in agreement on this. Whereas everybody could and was to cooperate in this great objective by working, the science however was responsible for achieving it, because all and everything was dependent on the progress of its new knowledge. However, its success could not reliably be organized like in any other kind of work, it depended on the unpredictable intellectual productivity. Thus, science became the most important profession which the scientist could only fulfill if he had an inner vocation for it. Science had to be a vocation in order to fulfill its (humanity) task. This way, the idea of profession got in the maelstrom of faith in science. After Nietzsche’s appeal for a **re-evaluation of all values** and thus also for a **new science** Max Weber contributed with his lecture “science as profession“ (1919) with the new motto **science for the (own) self-contemplation** to a further deprivation of mystique concerning this faith in science, which was to continue in the following years.

(Science has always consisted of individual sciences. In some one thinks, in others one should think more. However, the objective of all individual sciences certainly is that the science should teach how we learn to ask correctly for the things we do not know yet, but we could know).

However, the slogan **“work makes free“** would have been felt as an inhumane terrible cynicism in all cultures, not only as inscription above the gates of concentration camps.

### **3 The Historical Role of Europe**

#### **The change of understanding of work**

Here the modern, principally European civilization has led to a fundamental change, which in the meantime has also seized many other cultures. Work, (in the past) an arduous necessity, (later) has become a duty that makes blissfully happy, a task that gives sense to the existence, with which the modern people identify themselves. Unemployment makes life not only useless but also meaningless. The leisure time, the deserved holidays, but also the activities like sport, hobbies and entertainment, which are irrelevant for the socioeconomic security, have strongly gained importance and not seldom they degenerate again into “work“. These activities are strictly organized like real work performances and build own important markets. In contrast to this, those (charismatic) professions which later manifested and demonstrated themselves in corporations, guilds [Gilden, Zünfte] etc. have lost importance, but above all independence and self-determination. The legal generalization led to a conforming process of the societies and corporations, which - like at the initially autonomous and private universities - in the end meant a nationalization and terminologically led to the abstract concept society. Later it was expanded by the concept “mass society“, to which the individual felt of being exposed, threatened with isolation, provided that he does not make himself useful and does not work.

#### **Europe and the science**

The modern Europe not only grew up with modern science, but also with faith in it. This faith developed in Europe, since one expected from modern science - and with its own consent - not only the improvement of the exterior existence conditions but also a reliable philosophy of life with a binding response to intellectual moral questions.

That what we call science today is a modern creation - starting in the 17th century. We call it empirical (modern) science. What science was for the Greeks does not need any experience. One is absolutely sure of the fact that two times two equals four, that it would be senseless to

refer to experience for it and diligently count things. Where experience is still needed you do not have the highest form of knowledge - a Greek thought. The decisive breakthrough took place at Galilei. Here was a man who explicitly said about himself and his new science, the mechanics, *mente concipio* - I comprehend in mind, and he meant with it the pure conditions of the movement phenomena in nature, - the law of free fall - which could not be observed in nature and by means of the experiment only when it was possible to create a vacuum in the laboratory. The power of abstraction, which was necessary for this thought, and the power of construction, which belonged to it, to isolate the determining factors, to measure them quantitatively, to symbolize them and to refer them to each other, these were indeed new things, that were to bring about a change in fortune concerning the world relationship. Until now the human power of invention was rather a filling out of spaces which nature had left free. Now a time was approaching, in which human expertise learned to alter the nature into artificial products and to transform our world into a big workshop of industrial work, an unprecedented progress, that slowly leads us into the vicinity of new dangerous zones. Thus, philosophy had to face the new task to mediate these extremes of the (researching) new start into the unknown and the conservation of a familiar and understandable knowledge of life with each other, Hans Georg Gadamer writes in his book „The heritage of Europe“, Bibliothek Suhrkamp, Frankfurt/Main, 1990.

### **Empirical science and a necessary theory of measurement**

If we regard the type of knowledge “empirical science“, we realize quite soon that also there metaphysics and ethics beyond the fundamental interconnection play a constituting role. For instance, we find historical examples for it, where Johannes Kepler bases the new conception of the world on a sun-mystics and postulates on the basis of the renaissance spirit that the construction principles of the universe should be recognizable for man. However, Kepler is content with mathematical approximate equations.

The empirical sciences are not so completely empirical as is often claimed. The method of verification (logic empiricism) and falsification (critical rationalism) uses pure facts to judge the validity of theories. In reality there exist even in physical theories no **pure** fact. Who measures needs a theory of measurement, concerning the quantities to be measured and the measuring equipment. One goal of the empirical science is to get a more complete “picture“ of our environment, i.e. to achieve more truth of the reality. Because of the limited observing window and because of the characteristics of the measuring equipment **all measurements have an unavoidable finite uncertainty range - mostly called “error“**. This uncertainty (error) is easier to determine for “in situ“ measurements than for remote sensing measurements where the sensor is remote from the location where the (physical) parameter must be measured.

Data from remote sensing measurements are generally described with integral equations which contain the interesting parameter within the integral. In order to obtain these parameters the integral equation needs to be “inverted“. Special mathematical tools (inversion algorithms), powerful computers, some “apriori knowledge“ and the just mentioned measured data are required. The measured data will have an unavoidable finite “error“ and in the case of remote sensing data they should be verified and validated. The smaller the unavoidable uncertainty the smaller will be the “error“ of the solution of the integral equation. For non linear error propagation - “chaos situations“ - a small uncertainty in the measured data can lead to a large error in the solution of the integral equation. Only in the case of pure mathematics the (measurement) error is negligible so that a solution of the integral equation that has only a small difference to the apriori can be considered a more realistic “picture“ (*more truth*) of our environment, which means it brings something **new**. In the other case the solution might just be called a confirmation of the “apriori knowledge“ (**Input = Output**).

The more different the error theories are the more probable it is that there will be a dispute if really something „new“ was measured.

### **Remarks:**

*If you consider the studies of modern philosophy, you sometimes gain the impression today that some philosophers after long, complex argumentations hardly say more (output) than what they presupposed as assumption (input) and that they basically only confirm their expectations.*

*In communication engineering a similar situation may appear in case of repeated filtering of white noise with the same filter, which in the end only supplies the (total) “filter characteristics“ and which is often confused with the content of the “filtered“, in reality, however, does not say anything (new) about the content of the filtered.*

*More than 160 definitions for information exist today. This leads not only to confusion but contributes also to the present growing information crises. The author added another one: „Information is „created“ by a filtering process i.e. is time dependent“. This yields to a new description: **„Information contains (preliminary) certainties which are made prominent against the (determinable) uncertainty“**. If and how much this happens is determined by at least two different time intervals (observation time and filtering time constant). In analogy to radio science, the determinable uncertainty: the noise, is as important as the preliminary certainty: the signal. In the conflict area of question and answer both are inseparably connected with each other.*

*In the last decades this unavoidable (determinable) uncertainty led to an increasing uncertainty of the previous, partly very uncritical faith in science. For that reason, it is not surprising that to the same extent the „thirst“ for sure (esotericism) knowledge has grown. This is proved among other things by the fact that a rising number of people hope for the „new age of the Aquarius“ or for the „new magicians“, who promise to overcome with their magic the frightening imperfections of reality and / or the lack of knowledge.*

## **4 What Does Work Mean Today?**

Work has become an inner compulsive act, the toil and stress of which are compensated by means of confirmation in the competition, higher reputation by means of success and successful striving for possession. This modern idea of work has spread almost worldwide and is not compatible with the traditions anywhere, which considered work rationally as necessary, in a certain sense also as valuable, but not as an “activity“ that gives a special dignity or even sense of life. Since then culture results from leisure. It needs silence, composure and “serious play“ and amazingly the cultures gave the unusually talented (charismatic) people, if they were able to become aware of them, the necessary freedom, in which they could - judging from experience extremely eagerly and efficiently - use their special capabilities. Experience shows that their extraordinary talent could not be trained, acquired or ordered and could not even be reliably passed on. All cultures saw in it a charisma that has to be fostered and cultivated, less in the sense of a pedagogical task than in a “gardening“ sense. (Here the agricultural meaning is transferred to intellectual and political capabilities.) In almost all cultures the consciousness that these tasks do not only have to be considered as activities, like all others, as work more or less was maintained until modern age, in Europe until the threshold of the 16th century. Culture would be too essential, creating sense and dignity of man’s life, entrusting it to capacities and efficiencies, which can be learned and trained. Only with Niccolò Machiavelli, to whom politics became an end in itself, the change began, and

culture had to subordinate to politics. At the same time the people who actually only were working, the needy agricultural workers and peasants revolted, which still built four fifths of the European population. The church could not avoid recognizing the charisma of the Franciscan poverty, which wanted to serve the poor. In the Franciscan population movements work, productivity and efficiency of the individuals or groups maintain unmentioned. However, the Franciscans made the essential contribution to the fact that the Europe's way of seeing itself fundamentally changed. By means of the nominalism, which they represented, language became a system of "arrangement", which was agreed by all individuals. Only this way it became conceivable that in this system an individual could learn anything and could be trained in an arbitrary way. The European humanism and the Enlightenment made great use of this. They proclaimed the "education" (classes and training), a concept which meant for the inquisitors "pulling out the wrong consciousness". Like formerly by means of mercy without any reason, man now is to be redeemed through diligence and performance, well-founded. Only now it is conceivable that "work makes free". Workshy people, unemployed people and people who are unable to work or also the "unskilled" workers can now be banished with contempt and carelessness from the visual field of the bourgeoisie, to which the "value" of an individual depends on his performance. Until today the "unmeasurable" dignity of an individual is measured according to his "value". At first the European socialism drew the attention to the real value of work and performance and counteracted the inhuman exploitation of the working European population. (Only now we begin to see the inhuman, thoughtless exploitation of peoples of other continents at the same time in its total dimension.) Our new prosperity is a result of the work (work performance and division of labor), the valuation of which is deeply fixed in the consciousness of the modern man. At this time work and efficiency have also become "objects" of demand and supply regulated by the market. Thus, not only the economies have fundamentally changed in their structures, but also the understanding of work. Therefore, since the awakening socialism one has constantly thought about the concept "work". Currently it is possibly even more unclear than ever before, unless it is rigorously reduced to such performances, the value of which is determined by market-conforming payment, as it is proposed by the left or right economism.

**Remark:** *New and above all unconventional considerations and proposals, particularly a model of three levels concerning the topic work, are presented in the recently published book „How we will work“, by Orio Giarini and Patrick M. Liedtke, Verlag Hoffmann und Campe, Hamburg, 1998.*

## 5 What Now?

To the question what to do if not to work, there could be found many and very different answers in the past, nowadays, however, only an "occupying oneself", which is similar to a „being occupied“. For this reason some leading economists have already come to the following conclusion: If there were not already plays, arts, rituals and religions, one would have to invent them, so that people have something to do without producing or consuming (on an industrial/employment level).

Like all values work is an "object" of valuation, as far as it is possible to judge the corresponding human performance. Modern human formation and education have the target of making people efficient on a regular and equal basis, so that as it is required by the principle of equal opportunities, each individual has got access to any activity and thus to a corresponding opportunity for earning money. (What he has got, he has worked for, it constitutes his self-esteem which mostly has replaced the consciousness of dignity.) In the

meantime also most of the national states (“societies“) which are not industrialized (yet) strive for this and they reproach the (highly) industrialized national states for not allowing it. Of course, the impoverished approximately two thousand millions of people, who eke out a miserable existence, are not idle or workshy, but they do not find any possibility to work in a way that is usual for us today. (If they were able to do so, the raw material and environment problems would be even worse than they are at the moment.) This unemployment caused by infrastructure is alarming and brings about increasing dangers. Big migrations will economically and thus also politically not be stopped, but at least they will be decreased in case of a corresponding efforts. Therefore, one has to think about the problems not only on an economic-ecological basis, but especially also on a political basis. For this the topic must be discussed with a high level of attention and in a demythologized and desacralized way in an atmosphere, in which subsidiarity and cooperation (“real and honest cooperation“) for the decrease of the growing imbalance of the world economy still have a meaning. However, there must also be the will and the capability to put the results into practice.

There is the lack of a demythologized, anthropologically founded theory of work and therefore it must be developed. It should make understandable that there is not only a great number of local, regional and global as well as national problems, but that they cannot be considered as being independent from each other any more. This theory must consider that on the one hand human beings are affected, who want to provide themselves and their families with the necessary goods by means of work - in this respect there exists without any doubt a right to work-, and on the other hand that work can not only have very different forms of education, implementation, division and organization in the different cultures, but also very different contents. However, in the meantime it has become inevitable that all societies adjust the usual working hours.

In principle, time is the only reliable and informative measure of all (economic) activities, not only for the objective evaluation, but also for the subjective one. What work, leisure time, the play, the meals, the prayer, being together with friends and the sport means to me as an individual or to us as a community can be judged by the time we spend for these activities and by the intensity with which we practise them. In this context, it should not be forgotten how strong modern cosmology and biology shakes our previous understanding of time. Is it possible that for this reason the western idea of „time is money“ has found such a great acceptance? The following fact could be an indirect confirmation for it. 40 years ago the relation of goods turnovers compared to financial turnovers was approximately 1:1, today it is 1:30, and the „global magical trainees“, the brokers increase their investments at this „stock exchange roulette“ more and more quickly. The modern education neither enabled the new magical trainees - exactly 200 years after Goethe’s “Zauberlehrling“ [magical trainee] - to control their „flood of shares“ nor made possible to counteract sufficiently the technology consequences and effects.

## **6 Between Science and Religion**

Science and religion have the same origins on three levels:

1. They have grown on the same soil - the biological Homo Sapiens.
2. The driving force behind both science and religion is the “thirst“ for truth and justice.
3. There is one early primitive form in which they both express themselves - myths.

In each culture science and religion were therefore unseparable in their beginnings. Their separation starts considerably later, for example in Europe with the beginnings of the secularization and the empirical science, which eventually led to today’s enmity of the two.



This is finally slowly diminishing - to the extent that we understand and accept that these are complementary structures and their enmity therefore a imagined problem only. It also becomes obvious again that science stands for what people are able to know and religion for what people should do. "True science and true religion complement each other in the quest of mankind for truth, justice and beauty, in which inhuman, scientifically founded improvements of our living conditions are just as limited as the superficialness of religious searching for truth. In this context, the theologian Hans Küng wrote in his book "Project World Ethos", Piper Verlag, München 1990, on page 121 the following:

„True **humanity** is the **condition of true religion!** This means: The Humanum (respect of human dignity and basic values) is a minimum demand at each religion: at least humanity (this is a minimum criterion) has to be a given fact, wherever one wants to realize true religiosity. But why then religion?

True **religion** is the **perfection of true humanity!** This means: Religion (as an expression of encompassing sense, highest values, absolute commitment) is one of the best conditions for the realization of the Humanum. Especially religion (this is a maximal criterion) has to be a given fact wherever one wants to realize and concretize humanity as a truly absolute and universal obligation.“

*Remarks: C. F. von Weizsäcker describes the rationalism as the essential feature of modern science and as the risk of a cognition without love.*

*The new string-theory brings physics or cosmology more and more away from the area of the (verifiable) fact knowledge to the area of faith knowledge.*

## 7 Space Research or Environmental Research from Space

(The author has worked theoretically and practically more than 30 years in this working field. His understanding of science was decisively shaped in this field.)

Since the end of the cold war science and research have considerably lost influence. However, in addition to this the space research, which played a special role during several decades, has to face a fascinating competition with the fast increasing "Cyberspace", which continues to decrease its influence.

Cyberspace describes the possibilities of direct connection of (computer produced) digital information with the human perceptive capability. In this context, among other things the so-called "virtual reality" (VR) is created, also called virtual environment, which makes possible „journeys into the human (inner) space“, fast, simple and cheap, but partly also dangerous, because it makes dependent. Concerning the topic Cyberspace the American philosophy teacher Michael Heim says in his book "The Metaphysics of virtual Reality" (Oxford University Press, 1993): „The computer recycles ancient Platonism ...“ - and one should perhaps add - „and connects it with a simple possibility for the escape from reality.“

If one does not succeed in making science in general and space research in particular, or the increasingly important global environment research from space, more "attractive" for the public again, the government financial supports for it will continue to decrease, at least as long as the economic crisis situation continues and the search for private "sponsors", who - for what reasons ever - want to support space research, has to be increasingly continued. (The means in the sector of extraterrestrial basic research were reduced by more than 50 % during the last years in the Federal Republic of Germany.)

Only by means of such an additional (longer-term) support the previous investments and the knowledge can be "saved" in the future and the corresponding necessary longer-term jobs in space research. Then, without any doubt, also in this sector **more innovations** can be

expected than currently. The politicians are waiting for it with impatience, in the faith of being able to face the world economic crisis in a much better way. (Innovations at all costs - as an end in itself - can be highly dangerous or can become highly dangerous by their consequences.) **Progress through science** is the motto today! What a difference to the ideas of 200 years ago, when one began to believe in the **progress of science** for the first time in Europe! The many discussions which were led or are led in this context until now have only contributed little to a clarification of the fundamental problem and they will not do as long as we do not know exactly, what we want to understand in detail by the concept „progress“. In this context, C. F. von Weizsäcker mentioned: “An unlimited progress, which is only a technical material one and does not contain a greater maturity of consciousness and perception at the same time, can only be disastrous“. Here particularly the responsibility of science or of the scientists in a synergetic „in-between of politics and economy“ is required. The nowadays more and more necessary precaution measures, especially because of the (negative) technology consequences in the environment sector, make clear that science can and should not be a profession like any other. One must very consciously „create“ more „knowledge“ in a synergetic *between* of profession and vocation, an „in-between“, and one has to understand science more than before as an instruction for questioning thinking to be in a better position of assuming the necessary responsibility and to be able to counteract the negative trend, for example the increasing enmity towards science. Being aware of his „role as a court jester“ the author tries to initiate a corresponding dialogue by means of this essay. He particularly hopes for an active (practical) support by the directly concerned „healthy middle class“ from science, technology and administration - on a public and private level - as well as for a more fundamental support by the competent, mostly only indirectly concerned, small (political and cultural) „elite“.

## 8 Summary

The author neither develops a (new) theory of science nor a new theory of work, but only reports about ways of thinking and wants to show with it how necessary these theory (theories) would be. If there is not another clearer, but particularly less arbitrary understanding of science and work soon, the international community of scientists will have to reckon with even more unemployment and insignificance. Then the Germans have to say good-bye to the almost 200 years old (German) Humboldt's ideal of „education by means of science“, to which the German universities are still obliged today. In order to counteract this trend it is necessary today to consciously „create knowledge“ in a (*synergetic*) *in-between* of profession and vocation.

**Remark:** *The SPD-politician (Social Democratic Party of Germany) Peter Glotz has thoroughly analyzed the current situation of the German universities and has made improvement suggestions. He does not want to „throw away“ the concept education, but „think it out further“ and he also wants to maintain the thought „education through science“ as a basic principle - at least as long as his question whether there is anything better has not been answered yet.*

University reforms and education reforms which do not consider sufficiently these fundamental changes in our understanding of science will only remain superficial “cosmetic repairs“. Peter Glotz calls for a development of a **new communication culture** at or by means of the universities as well as for a strategy of separation, flexibility and self-regulation which are necessary but not sufficient conditions for a **„recovery“ of the German university**. Of course, for this more concrete and binding answers to the following both questions are

required: 1. What do we want to understand by science? 2. What do we want do understand by work?

For the author - 80 years after Max Weber's lecture - **–(empirically based) Science contributes to a better way of seeing oneself in relation to the cosmos, complementary to the transcendence, enables technical and technological developments, and it is for the scientists a pretentious possibility of self-representation.**

## 9 The Author

**Gerd Karlheinz Hartmann**, born in 1937 in Eschwege, Germany, studied physics from 1957 to 1964 at the Georg-August-University in Göttingen, where he received his Ph.D. in 1967. Since 1965 he has worked as a scientist at the Max-Planck-Institut für Aeronomie, D-37191 Katlenburg-Lindau. From 1975 to 1978 he was the provisional director of a division of the institute, the Institute for Long-term Control of Geophysical Environmental Conditions (ILKGU). For over ten years he concentrated his activities on studying the upper atmosphere using satellite beacon signals. Since 1978 his main area of specialization has been studying the lower atmosphere by means of microwave radiometry. He is **Principal Investigator (PI**, leading project scientist) of the international research project **“Millimeter Wave Atmospheric Sounder (MAS)** experiment for the use on the Space Shuttle (STS) which as a joint enterprise of Germany, Switzerland, the USA and for some years also Argentina has been flown as core payload of the NASA ATLAS (Atmospheric Laboratory for Applications and Science) Space Shuttle Missions of the NASA with the Space Shuttle ATLANTIS from March 24, 1992 until April 02, 1992, ATLAS-2 mission (Space Shuttle DISCOVERY from April 08 - 17, 1993) and the ATLAS-3 mission (Space Shuttle ATLANTIS in November 1994).

See also in the internet under: [http://www.mpae.gwdg.de/mpae\\_projects/MAS/MAS.html](http://www.mpae.gwdg.de/mpae_projects/MAS/MAS.html) and <http://www.dfd.de/info/AVC/MAS/>. In addition to these studies, since 1967 he has been dealing with general and specialized information and documentation problems, from the viewpoint of large volumes of time dependent and space dependent data, especially of the type collected in his research projects. At present he works as a consultant on several national and international committees and holds lectures and seminars throughout Europe, and especially in the USA, in Argentina, and Chile countries he has often visited in the course of his scientific projects. Since 1986 he is a guest professor and guest lecturer for filter and information theory at the University of Mendoza, Argentina. This task was extended in 1988, now also including problems of conserving utilization of the environment (sustainable development). In this context, he is the international coordinator of the environmental program PRIDEMA started by the University of Mendoza (UM) in 1988.

Since 1991 he is full professor for “remote sensing for a conserving utilization of the environment“ (sustainable development) at UM and also “external scientific director of the institute for environmental studies (I. E.M.A.)“ of the University of Mendoza (UM). In December 10, 1991 in Buenos Aires he received the Dr. Luis Federico Leloir Award for international cooperation with Argentina in the domain of environmental research from the Argentinean Minister for Science and Technology, Prof. Dr. R.F. Matera.

Right now he works on the proposal of a possible MAS-following project as well as on the value added validation of remote sensing data from the Earth's atmosphere and is manager of an international experiment proposal for the investigation of the MARS atmosphere in context with the MARS EXPRESS Mission of the European Space Agency (ESA).

*Newer interdisciplinary texts of the author*

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**Remarks:**

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- b) *The author thanks Prof. Dr. H.A. Fischer-Barnicol for important discussions and contributions concerning this topic.*

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