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A difficult problem for artificial intelligence: how to assess originality of scientific research and the dangers of apostrophes in family names.

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Intentio vero nostra est manifestare ea quae sunt, sicut sunt[1],[2]

from *De arte venandi cum avibus* by Frederick II Hohenstaufen

Abstract

A set of humans (as every group of primates, [6]) has a behavior which is ruled by complex factors. As already remarked by Asimov ([11]) the behavior of a group of humans may change simply if some of its members know about the existence of a theory developed for describing it. Hence, the introduction of (algorithmic) procedures aimed to measure the quality of the research of scientists (e.g. bibliometric indices) could be eventually useful only if they were kept secret. The present paper intends to attract

*In order to try to increase their h index the authors need to use all different versions of their name as recognized by the many different (but all somehow defective) automatic citation-detection systems.

[1]Our courageous (but very likely correct) translation is: Indeed it is our intention to manifest the phenomena exactly as they are.

[2]This paper is dedicated to the memory of Professor Luigi De Luca, one of the most wise, clever and erudite scholar whom the authors had the honor to meet. He has been one of the highest examples of skilled *Maestro* whom the Italian educative institutions could produce. The greatest part of the knowledge needed to write this paper was taught by him to the authors. We miss his humanity and enormous knowledge.

the attention of the scientists working in artificial intelligence to an emerging issue in science whose impact could be enormous: it is needed a robot who, while being intrinsically honest (maybe constructed to respect the Asimov's three laws of robotics), can measure the scientific value of published papers. However to have a fair use of these measures, the robots in charge should not divulge the greatest part of the details of the algorithm used. Until robotic fair assessment of the quality of scientific research will not be feasible, (i.e. until the Asimov's and Turing's dream of having available intelligent and fundamentally honest robots will not become reality) the method (established during Middle Age) of peers' co-optation and evaluation remains the only effective one for selecting the most appropriate candidates to any academic positions. This co-optation process must be performed by following some well-known procedures which seem to have been forgotten.

1 Introduction:

A wise colleague of one of the authors when discussing about the value, the impact and the importance of h-index and of all variously introduced similar indices claimed that he could not criticize these indices because his own personal h-index (together with all other introduced indices) are extremely low.[3] The bibliometric indices of all the authors (some of them can be also taken individually) of the present paper are beyond the median in the subgroup of scientists constituted by mechanicians: therefore, following the previously stated criterion, they can (at least collectively) criticize their use. The reader should remark that what has been used to select important chairs' holders, department heads or deans (so playing a fundamental role in a very important human activity) i.e. the calculation of bibliometric indices, is infected by an unbelievably stupid flaw: the presence of apostrophes in some family names.[4] Before starting to develop some rational arguments for supporting the thesis formulated in the abstract, it is suitable to review some more cogent facts concerning the (mal)practice of bibliometric indicators. It is however necessary to state explicitly here that the authors consider the document searching and distributing tools which are nowadays available a wonderful opportunity for the further

[3] Indeed the second author believes that this particular scientist is a very creative mathematician and that he proved theorems which will be useful in the next decades, if not centuries, in the particular research field where he became one of the greatest world experts. His results are so deep and sophisticated that only few living mathematicians can understand them and, exactly for this reason, his papers got only few citations.

[4] This unlucky circumstance has been inherited by some of the authors whose ancestors had the very bad idea of being the feudal lords of a castle controlling a ford in a river close to Salerno (South Italy): they were the lords of the island (the genitive *dell'Isola* in Italian). This ancient circumstance is now decreasing the number of their descendants' counted citations: indeed the apostrophe, for an arbitrary decision of an engineer whose name could not be found (however we can be sure that this name surely does not contain an apostrophe), is used as a control character in too many programming languages and therefore its presence in a family name causes a dramatic occurrence of software malfunctioning, in particular of those software programs searching authors' names in scientific publications.

advancement of science.

1.1 Frauds, cooperation in changing groups' bibliometric indices and similar behaviors.

Bibliometric indicators are sometimes believed to represent a panacea capable to care all diseases of the academic body. In this section we give some counterexamples to this statement which should persuade at least those readers who are more mathematically oriented. We will also describe some neurotic behaviors which are caused, in some scientists, by the use of bibliometric indices: these scientists instead of investing their energies in solving serious and difficult problems spend a lot of time in fighting for being cited as many times as possible.[5]

The case of the persons who publish one paper a week. A simple search in Google Scholar can prove that, in nearly every discipline, there are scientists who publish very often and (only!) in indexed journals. There are many who managed to publish (i.e. to have a paper which appears in a reviewed journal) every week of the last year. This means 4x12 papers in only one year. Of course they have co-authors. Still one wonders how it is possible even to read all the words which appear in all these papers! A scientific paper should be the final report about a longly pondered conceptual effort and about a deeply investigated subject, which is made public in order to facilitate the work of all other scientists. It is simply impossible for a single person to be fully aware of the content of every paper published with his name in the list of authors if he published a paper every week of the year, including every kind of holidays.[6]

The case of the person who searched personally all the papers which cited his own papers and wrote by hand a huge list. The registration of received citations can become an obsessive compulsive activity which neurotically absorbs the creativity capabilities (if any!) of the scientists. The authors have received some time ago an email from a colleague, who was very upset. Indeed this scientist had discovered that some of his papers were not correctly listed in the data bases containing the obtained citations. He wanted to let everybody know the correct count of the citations which he had obtained. One could hope that he had done this titanic job by means of a computer program. Actually it has to be sadly considered that, instead, he spent probably

[5] One could argue that those scientists who feel the need to spend time to be cited are to be assumed as surely noncreative and that their neurotic behavior is a symptom of lack of originality of their research: actually this is not the case. There are many creative scientists who lost a considerable percentage of their time in the effort to have their papers cited, as to be cited is the only way that they can see to have their ideas widely recognized. The academic system, because of the previously described phenomenon, loses its efficiency, believing instead to have increased it.

[6] One can have co-workers, of course: but co-workers, especially if they are young, need to be carefully guided and controlled. Sometimes having a younger co-author implies that the time needed to carefully produce a paper increases, if the senior author needs to teach to the younger one something before being able to get a substantial help (moreover very often as soon as the younger coworker learns how to work independently he decides that he does not want to be anymore exploited by that senile person who feigned to teach him something!).

whole months of work searching carefully and personally the web. He had a list of more than 5000 citations carefully and individually searched in the web.[7]

The networks of scientists aimed to produce cross citations. Even if it is not possible to prove, in a conclusive way, that the great majority of citations now appearing in published papers is simply the effect of a series of tactical choices of their authors and that they have nothing to do with serious scientific research, it is clear that the habit of counting citation for assigning tenured positions, financial support and academic responsibility roles is very dangerous, and intrinsically defective. This is not the opinion only of the authors, it is the strong belief, also, of many other scientists and academy administrators. We cite here J. Fokkema[8]: "Quality means more than the h-index, which is based on publications in traditional journals. The review committees are only interested in the h-index of the journals. So the researcher is just reduced to a number that's open to debate. It's a serious problem." We will discuss in a subsequent section how the competition for getting tenure position at University or Research Institutions can be regarded always as a game (in the sense of von Neumann and Nash): we claim that this game has to be carefully designed and its rules cannot be left in the hands of some commercial publishers. Here we can simply argue that it is very easy to organize even implicitly (see the following discussion about *tit for tat* strategy for optimizing the payoff in some kinds of games) some networks of scientists who increase each others' citations and bibliometric indices by means of well-tailored strategies, tactics and actions. It is so easy that it happens very frequently. This is an experimental and incontrovertible fact: **If there is an optimal strategy to maximize payoff in a game then the active agents will quickly learn how to apply it and will inevitably use it systematically.**

1.2 Pier della Vigna's optimal solution: peers' selection process

When looking for optimal solutions to some organization problems one should declare: i) which is the objective function (i.e. what exactly he wants to optimize) and ii) which is the set of choices among which he can choose the optimal solution (i.e. which are his constraints). The statesmen who considered the possible rules to be chosen to manage the newly founded Universities, in the XI, XII and XIII centuries, had to decide both the objectives that they wanted

[7] We believe that this activity does not have any scientific relevance: instead it should be carefully studied by the experts of some particular form of mental disorder. It is a perverse version of the push towards collecting which dominates the life of many humans. Instead of collecting stamps somebody is collecting citations: he needs citations from every relevant journal in his field, then he adds citations from journals of close fields: finally he wants citations from more generalist journals, encyclopedias or review papers. Of course the citation collector spends also a lot of time by comparing the set of citations which he collected with those collected by his friends and colleagues (and rivals!). In general he is never happy of what he managed to collect.

[8] http://www.openaccess.nl/index.php/openaccessindifferentfields/technology/48-technology

to pursue in the following millennia (indeed these men were explicitly placing themselves in a perspective which considered millennia as a middle term period) and the correct tools to be used to pursue these objectives. There were many of these enlightened thinkers and erudite scholars.[9] However there is an unanimous agreement (see e.g. [20]) that the Università degli Studi di Napoli was the first State University in the world after the beginning of Middle Age[10]. Indeed it was established by following a precise political program conceived by Frederich II Hohenstaufen[11]. The name of the man who wrote the letter announcing to the Sicily Kingdom the institution of a new university was: Pier Della Vigna[12]. As unfortunately we have lost many documents[13] describing the political and cultural acts of Frederich II (sometimes called Stupor Mundi: i.e. the man who astonished the world) in his long life, many of the following statements about the intentions of Pier Della Vigna are purely conjectural. **The reader is, therefore, warned that we will use his name purely as that of an eponymous hero.**[14] Pier della Vigna could not even conceive the possible existence of robots, and moreover he needed to solve a precise problem: how to select the best intelligences to nurture the young students of a newly established University. The conceived solution had to be used starting from 1224 (the date of foundation of the Università di Napoli, now named after Frederich II). Therefore he established a method for selecting all new professors for the University he was founding: the one which, in our opinion, allowed to Western culture and civilization to experience the most dramatic advancement ever occurred in human history (we indeed believe that the peculiarity of Western civilization resides in the institutions of Universities). We are talking about the system of co-optation from the top which is applied by a group of professors when, by gathering in a committee, elects a new professor. In the original statutes of the Studium Neapolitanum (variously modified in the subsequent centuries after its foundation see[1]) the role of the Sovereign was, after an initial starting stage, simply intended to give a last guarantee: the name of the selected man was presented to him to get a formal nomination. The committee had simply to avoid too scandalous choices to make less likely that the Sovereign could refuse to seal its choice.

[9]For instance Pepone or Irnerio (some of the founders of the Università di Bologna) or Robert de Sorbon (one of the founders of the Université de Paris).

[10]Most likely the library of Alexandria was indeed a kind of State University ([15])

[11]He was the grandson of Frederich Barbarossa (Red-Beard in Italian), i.e. the first Emperor who protected the freedom of the newly established Università di Bologna (Authentica Habita or Privilegium Scholasticum Friderici I).

[12]His fate inspired also The Divine Comedy by D. Alighieri, Circle VII, ring ii, Canto XIII.

[13]The most dramatic loss occurred in 1943, when the German army destroyed completely the whole repository of the official documents of the Kingdom of Two Sicilies.

[14]Really eponymous indeed, as because of his corruption the Emperor ordered that he be imprisoned and his eyes be ripped out: Pier della Vigna in his greatness and misery is a very representative example of human (and in particular Italian) statesmen.

2 Adaptive behavior to quality assessment criteria[15]

As everyone can imagine (and somebody knows very well) creativity in scientific research can be only the result of a long and enduring work based on scrupulous and patient application. Only other scientists who had spent an equivalent number of hours in investigating similar and related subjects can appreciate the innovative content of a paper full of technical and esoteric concepts. Moreover, as scientists are human beings, somebody who worked years without managing to solve a difficult problem could be very upset (and rather unfair) towards a maybe younger colleague who actually did manage to solve it. This is the reason for which, in Middle Age Universities, the rule was established that only groups of professors could collegially decide about the co-optation and career of candidates to academic positions.[16] The law which was nearly immediately settled concerning the collegiality of decisions in the academic bodies was partially made vain by the establishment of networks of professors which started to rule the Universities, bending the public interest to their own. These networks of power started to exert their influence by hiring younger professors prone to the wishes and ideas of the elders and sometimes managing to hire (indirectly: by means of chains of reciprocal favors) even their own children. Therefore more complicated laws where conceived: the committees were formed with professors exterior to the University were the new position was needed, the number of members of the committee was increased dramatically, the eligible candidates needed to be qualified or habilitated by independent scientific bodies, a candidate who had studied in one University could not be allowed to be hired in the same University and so on. All these rules have been more or less effectively circumvented by means of more or less effective tricks: it has to be accepted, however, that the average quality of European Universities (and of all Universities whose organization is based on their paradigm) has been great enough to produce the dramatic scientific and technological advancement which characterized the last three centuries. In other words: the system of co-optation has always shown many and important loopholes but notwithstanding this it seems to work rather efficiently.

[15] A famous Italian dictum states that: *fatta la legge trovato l'inganno*. This can be translated as follows: once a law is conceived immediately a loophole will be found in it, which makes it vain.

[16] It has been said that the modern form of democracy (which superseded the more ancient forms developed in Greece and then in Rome) was perfected by the European Academic Bodies who needed to take decisions in a condition of absolute parity of rights of their members. Of course, as clearly stated by W. Churchill (see also infra), democracy is not perfect: but we have no valid alternatives to it.

2.1 Networks of scientists cooperating to increase the groups' bibliometric indices

The social dynamics described by De Waal in [4] can be observed also in social groups constituted by scientists. Primates are consciously able to start collaborative actions to attain a common goal. Also it has been proved (see e.g. [5]) that evolution can select individuals who are able to have an instinctive and intrinsic moral behavior. It is *a fortiori* to be accepted that: **In every group of scientists if a given behavioral strategy is convenient in the short and/or in the long run then this strategy will be inevitably adopted by the great majority of agents in the group.** Therefore: even if ethical behavior remains rather frequent because our common heritage with all primates, whatever are the rules adopted in the considered society, **if a rule allows for a convenient strategy this will become a common and accepted behavior** (this point will be also discussed in the section about Nash Equilibria).

2.1.1 Scientists as agents of a cooperative/competitive game

The fight to get tenured positions in the academic system is surely a competitive game. Some different candidates want to get the same position. Some positions are preferred to others, and many times many different candidates try to occupy the same position.[17] On the other hand the fight for getting tenured positions is also a cooperative game. One needs to be recognized qualified by his future peers for getting a position. Of course elder scientists try to promote some of the the younger ones. They usually prefer to support those among the younger ones who continue their works (or simply praise them publicly or seem to be able to support the elder scientists power ambitions). Therefore a young scholar who writes a work in which a given maestro is appreciated and supported is more likely to get his help. However this help is always conditioned: if the young scholar risks to become more famous or more appreciated then, even if he has suitably recognized the elders' contribution, he will find many obstacles to his career[18]. Cooperation is always conditioned to the level of competition which

[17] French laws are openly admitting this truth: they organize the competitive competitions via a software which in a given moment plays the role of the judge in a competitive game. Indeed candidates can apply to different positions in different Universities. A selecting committee is established for every position. This committee is constituted by a minimum of 10 up to a maximum of 16 professors. The committee after a ritual procedure lists the qualified candidates following the order which it considers is actually reflecting their specific scientific merit. Then every candidate (via Galaxie software) assigns his/her preference to each position for which she/he was considered as qualified. The choice is made simultaneously in a given short time interval (few days). Each candidate is then appointed in the position which meets the following criteria: it results to be available (that is: no other candidate with higher position in the merit list has obtained it) and it is the most preferred one by the choosing candidate among the available ones. It is clear that the French legislator was aware of the basic concepts of the theory of games (as often happens since the French revolution and the fundamental works of the Marquis de Condorcet).

[18] As an example among many, recall that the life of Austrian surgeon Semmelweis was destroyed by the professional rivalry of his colleagues who managed to have him hospitalized

is intrinsic in the game for glory, power and better positions. This situation must be recognized by legislators and suitably controlled by clear and effective rules, as they risk to stop the advancement of science. In order to win in the game *fight for tenure positions* one needs to be clever, but not too much (or at least he needs to hide his being too clever), one needs to be helped by elder colleagues and therefore he needs to behave in a reverent way towards those who are powerful. However he needs also to show to the competitors of his elder supporters that he will be independent enough, when he will have got the position, to assure that his supporters will not get a too high advantage from his promotion: in this way the opposition will not be too active against him. Aforementioned subtle strategies are perfectly described by Machiavelli and have been observed in the groups of primates ([4]).

2.1.2 Commercial publishers exploiting "the publish or perish game" rules.

In the competitive/cooperative game for academic positions a relevant role is played by publications. One scientist and his creativity is recognized by his peers when they appreciate the value of his written works.[19] After the careful choice of papers to cite, the next step towards an academic career is the delirium leading to *the publish or perish* behavior. In order to be cited one has to cite a lot: and to cite a lot one needs to write a lot. This is an explanation of the unbelievable performance of the scientist who published a paper every week for a whole year. This performance has a deep logical motivation in the need of citing many members of one's own network in order to get, in the logic of tit-for-tat strategy, correspondingly many citations for one's own papers. The measure of one's ego is the number of citations obtained, and many persons need a concrete materialization of their ego into one number: the h-index. Somebody's ego is even greater. He needs many numbers: total citations, number of papers cited more than ten times, number of papers reviewed in a special data base gathering very special persons and so on. Of course competitors and rivals tend to organize counterstrategies: they start to introduce numbers for limiting the egos of the others. So the number of citations obtained has to be compared with the number of the citations produced in one's own papers. Remark that those who wanted to introduce such a refined index implicitly admit the existence of citation networks! To be precise: let $N_O(A)$ the citations obtained by the papers of the author A. Let us call $N_P(A)$ the citations that A included in his own papers. The true measure of the ego of A, following his rivals, should

in a clinic for mental diseases where he was beaten to death: his fault was to have recognized that it is necessary to wash one's hands when caring patients in the hospitals and that it is better to frequently change the patients bedsheets.

[19] Unfortunately reading technical papers is difficult and time demanding. Therefore, very often, the game is not played as it should ethically be. One cites powerful colleagues hoping that they will cite you back. Very often the content of cited papers is unknown to the citing authors: it often happens that some citations are flagrantly wrong. The authors very often could not find any trace of the fundamental results which even had been cited in many subsequent (and sometimes reverent) papers.

be indeed the ratio $R(A) = N_O(A)/N_P(A)$. Of course also this number is absolutely useless. For instance: if A has some money he can spend it in order to support some special issue of some journal, where authors from many different emerging countries can publish for free. These authors will gratefully cite their generous sponsor. It is clear that there is absolutely no way to invent a number which will induce ethical behavior in any group of scientists. Scientists cannot delegate to publishers their work. The most important part of the work of scientists is to read the works of their peers (and of those who want to become their peers) and judge them. Papers have to be judged! It is risky, one can be wrong: but this action is essential to the advancement of science.

2.2 Peers' co-optation by not-so-large committees versus automatic calculation of bibliometric indices

A different personal responsibility involvement is required when participating as a member to a selection committee if compared to the involvement implied into accepting to cite papers written by colleagues or younger scientists. Nothing can, at the present stage of the development of Artificial Intelligence, replace the action of a relatively large group of scientists in the selection process of new scientists. Bibliometric indices can only detect some social or political capabilities, the strength of a group of agents in supporting a member of their group, or they can be the result of a (even moderate) financial effort.

2.2.1 The designer of the game *fight for tenures* has to consider some important aspect of human nature and of the nature of scientists.

Indeed: i) many (maybe even not an absolute majority but surely a relative majority) scientists have a great concern about the advancement of science and therefore they are aware of the importance of linking their names to actions promoting it; ii) non-original scientists (the great majority) are however able, under particular conditions, to assess the absolute value of a candidate for a position; iii) also scientists have children, husbands/wives, mistresses/lovers, friend, preferences and not well-grounded opinions; iv) sharing responsibility leads to a process of total shunning of responsibility: therefore one should not ask small and frequent assessment of quality but a reasonably important and public acceptance of responsibility; v) it is not possible to assess the quality of too many papers and too many scientist in too wide research fields. To ask always to the same network of persons to judge the quality of candidates for tenures is not only not ethical but simply not efficient. As a consequence the assessment of the quality based on the bibliometric indices is simply a nonsense whose sole effect is to distribute research money to predatory and commercial publishers. The effects induced by the introduction of bibliometric indices are clear: more useless papers are published and sold at very high price.[20] To ask

[20]Indeed: to accept to cite a paper is not an action involving a large amount of personal commitment. One can always try to say that he believed really and in good faith that the

to many hundreds of authors to indicate anonymously or nearly anonymously who will be the next holder of an important chair is not only stupid, but it is extremely not effective and inefficient. The correct method is the following one (we can call it Pier della Vigna's method for convenience): An external (and far) authority must select, also using a ballot, a relatively large number of members of a selecting committee. The number of positions attributed by a single selective process must be very low: possibly simply one. The works of the committee must be public and everybody must know who were the members of the selecting committee which elected one professor, so that their direct responsibility must be indisputable. The candidate must be holder of some academic titles rewarded by another and independent committee, whose composition must be known: for instance habilitation for professorship must be obtained by discussing a thesis in presence of a committee whose members will be permanently associated to the name of the habilitated persons.[21]

2.2.2 Erudition is not creativity

Remark that even if Leonardo clearly is not an original thinker ([19]) when he used high quality sources his statements are deep and correct, while in other parts of his works he is naive and superficial. Theories, models, scientific results need to be judged by themselves and not by referring to the *authority* of his author (or presumed author). Creativity is a fundamental feature of human intelligence, and a challenge for those who are working to obtain an Artificial Intelligence (AI). We want here simply to draft few ideas and considerations about this very challenging subject, which fascinated many scholars in every époque. The authors found very interesting the papers [12, 13, 16]. They give only a very vague idea of the enormity of the challenges to be confronted in the field. However we want to cite here [2] "AI techniques can be used to create new ideas in three ways: by producing novel combinations of familiar ideas; by exploring the potential of conceptual spaces; and by making transformations that enable the generation of previously impossible ideas. AI will have less difficulty in modelling the generation of new ideas than in automating their evaluation." Creativity[22] is to be recognized by groups of scientists who will need to discuss

cited papers were containing novel and relevant informations and that the readers of his own paper needed to know where else the conveyed informations could be found. Moreover the battle for citations makes even easier to be weak towards the citations requests: if a reviewer wants to be cited he always manages to delay the publication of your paper. Moreover as the quality of journals is assessed by means of Impact Factors then the editors-in-chief of all journals are very inclined positively towards papers which are citing correctly a given list of important (because they were published in the right journal) papers. Of course even if one really follows the strategy tit-for-tat there is absolutely no way for proving the reality of such a behavior.

[21] No scientist with a reasonable self-esteem will participate to such committees without the greatest concern about HIS OWN reputation. Moreover the presence of many members in a committee will limit the search for personal interests of any individual member of the committee. This circumstance will induce a social dynamics which will have as a final result that the dominating interest for every committee member will be to preserve one's own reputation.

[22] It is clear that erudition, intended as the mass of notions, fact and ideas which, in a given moment, can be recalled by a scientist, is not creativity. A good computer and a quick

with newcomers of the scientific community in order to be persuaded that the ideas of the youngest researchers may be fruitful in obtaining new results, new phenomenological evidence, new concepts and conceptual frameworks.

2.3 Prerogatives to be assured to scientists give more possibilities to those who are capable of frauds

Scientists must be left free to follow their investigations and speculative ideas: therefore they must enjoy some prerogatives as, for instance, freedom of choosing their research fields, economical independence and freedom of choosing their successors. Of course these prerogatives may be the cause of misbehavior as somebody may decide to pretend to be a scientist simply for having the possibility of exploiting the privileges related to the obtained position. However the only method which has been effectively used (since the birth of exact sciences) to form scientific bodies is based on peers' co-optation performed by means of clearly specified and public procedures: after some subsequent career steps the co-optation must lead to positions in which the scientist is left free to pursue his own research without any constraint except the prerogatives of his peers. The risk that the co-optation system could fail to select the most appropriate candidates for academic positions is always present and indeed every serious scientist may list many examples of absolutely inadequate persons selected to occupy very important positions. It has to be accepted however that (we rephrase here what stated by W. Churchill[23]) **the system of peers' co-optation for academic positions is the worse method of candidates selection for academic positions except for all those other methods that have been tried from time to time.**

2.3.1 Science is a choral endeavor which lasts millennia

Euclid was said to order to one of his assistants to give a coin to a student who had asked him about the utility of learning a certain theorem. Although such a story may be interpreted in many ways (one of the authors heard somebody to claim that Euclid while behaving in that way did show the typical arrogance of the mathematicians) it usually is meant to send a message: mathematics (and in general science) has not a direct immediate utility. Theories are conceived to give us a **Weltanschauung** i.e. a comprehensive **world view** which is then applied to understand how to act in specific circumstances.[24] Hipparchus of

connection with the web can transform everybody into an erudite. Nobody will claim that wikipedia is creative, although it can quickly supply a huge amount of very often high quality informations. To be able to repeat word by word a poem does not mean to have the necessary creativity to invent an original poem. This statements are so obvious that one should not even be obliged to recall them: unfortunately the recent historic cycle (see [15]) seems to demand for such repetitions.

[23]Churchill's famous dictum: "Democracy is the worst form of government, except for all those other forms that have been tried from time to time." (from a House of Commons speech on Nov. 11, 1947)

[24]Understanding the laws of gravity allowed humanity to travel towards the moon, but there was a delay of centuries between the moment when the concept of escape speed (i.e.

Nicaea has been, see [15], one of greatest scientist of the Hellenistic period. He is considered the founder of trigonometry but he is most famous for his discovery of precession of the equinoxes. According to Pliny, Hipparchus compiled his catalog of stars precisely so that later generations might deduce from it the displacements of stars and the possible appearance of novae: in other words he started an experiment (i.e. the measurement of the apparent position of stars with respect to the referential attached to the earth) which could not be completed during the span of his life and needed to be pursued by many of the subsequent generations of scientists. The final achievement obtained by Hipparchus and his (more or less aware of their role) successors has been a main advancement of knowledge of humanity, which allowed us to understand exactly our place in the universe.[25]

2.3.2 The prerogatives of scientists needed for advancement of science

Usually research requires a large investment of intellectual efforts: a scientist should not be obliged to worry about the practical problems of everyday life.[26] Scientists work in order to obtain permanent results in the long run. Nowadays, when a professor of Mechanics decides that Tensor Calculus needs to be taught to young students or when a professor of Mathematical Analysis elaborates a new methods for teaching his discipline basing it on Topology, the first reaction of his colleagues and of some of his students may be very negative. However in the long run the systematic use of these powerful conceptual tools may dramatically enhance our society's capability of producing sophisticated technology.

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the speed needed to *break free* from the gravitational attraction of a massive body, without further propulsion, or equivalently the minimal speed needed to escape the gravity of a planet) was formulated and the other moment when it was applied. Moreover, and more interestingly, such a concept is secondary in the framework of the whole theory of gravitation and may be considered not at all interesting by a theoretician seeking for a **world view** allowing him to understand the universe: indeed he may be interested instead in such a concept as a nova formation, concept whose practical application is not yet in view (although in science fiction it has been conceived the possibility of using a destructive weapon which may be capable to transform a star into a nova and therefore destroy all planets around it).

[25]Without trying to give even a partial list of human achievements which needed centuries to be accomplished it is worth to recall a famous dictum transmitted by the wisdom of the people of the desert: *those who plant date palm trees are not those who will eat dates*. Those who live in the desert while eating dates always gratefully must thank those ancestors who cultivated a tree which was completely useless for themselves but was indeed so important for the survival of their descendants. Scientific knowledge needs to be cultivated as a dates palm tree: nobody should ask which are the immediate advantages gained by the development of a theory. If it is correct it will produce fruits for the descendants of the scientists who first formulated it.

[26]The example of the Austrian surgeon Semmelweis can be again fruitfully recalled. He was the head of the department of gynecology of an hospital in Vienna. When he discovered that infections could be stopped by disinfecting the hands of nurses and doctors and that it was wise to wash often the patients bedsheets, he tried to enforce the corresponding rules in his department. The reaction was very violent and he was treated as an insane. He was not allowed to prove that his theory was correct and, even if by applying it the number of dead women had quickly decreased from 15 % to 1%, he was actually removed from his job.

Once a scientist, his capabilities, his world view and scientific project has been tested by a committee of peers, then he must be allowed to deploy his project in the due time period, which could also be long some decades. One cannot ask continuously to a Levi-Civita or to a Banach why the society should pay their salary: after a careful and honest exam of their capabilities, performed with the rite of a comparative exam by a respected and large number of peers, then they must be left to their work, hoping that they will succeed. Of course not every chair holder is a Levi-Civita: however the society must risk to waste some money for supporting some not so highly gifted scientists being sure that among them there will surely be a very creative mind who will allow for the advancement of science. The others, those who are not so creative, if the selecting process is suitably fair, will be still clever enough to understand the value of the innovations introduced by their more gifted colleagues and will be able to teach to the younger generations the most useful and advanced concepts and ideas.[27]

2.3.3 Bibliometric indices cannot replace maestri.[28]

The only effective way for producing and controlling the quality of scientific research is to establish educative institutions where *Maestri* control daily the quality of the work of their pupils. In modern time the relationship between Maestri and Pupils is becoming more and more difficult, as this relationship has been considered the cause of academic nepotism. The educative system which allowed for the exponential growth of Western civilization has been recently disputed and very often considered non-democratic.[29] The supporters of bibliometric indices claim that these parameters are objective and therefore intrinsically democratic. **They believe that a majority vote can establish if a statement is scientifically correct or not**.[30] It is even too easy to drive a large assembly to follow his populistic leaders: indeed it is well-known that it has not to be left to large assembly to judge about the guiltiness of suspected criminals. The invention of bibliometric indices was motivated by somebody as

[27] One scientist should not be bored by the problems of everyday life, by academical battles, by too strong limitations of movement and should be able to pursue his scientific projects by obtaining the suitable financial support from his institution. Of course while some of these prerogatives must be assured to every chair holder, some other few prerogatives could be subjected to a further peers' reviewing process to be managed similarly to the process regulating the attribution of chairs.

[28] Or: About the importance of the transmission of knowledge and self-discipline to younger generations.

[29] It is really surprising that these objections (which were used as a justification to destroy the effective and long lasting educative system established already during the Hellenistic age) are not new: the attentive reader will find them listed in the Plato's The Republic, and there rigorously confuted. On the other hand those who arrived to believe that a bibliometric index could measure creativity in scientific research usually do not lose their time in consulting Plato's works. The control exerted by the elders on the younger scholars' studies has been considered in modern times a form of tyrannic behavior to be despised.

[30] These supporters should remember that a whole conference gathering the most famous surgeons of their age decided with a overwhelming majority that disinfection of surgeon's instruments was dangerous (sic!) for the health of the patients! (this again happened to doctor Semmelweis during his tragic life).

a tool for introducing an objective measure of the scientific quality of scientists. This objective measure was claimed to be independent of the arbitrary judgment of the Maestri about the quality of the research of their pupils. The declared intention was to find a way for breaking the influence of the elder scientists on the activity of younger ones and to enforce more democratic quality assessment tools. Even if all the authors suffered a lot for the bad temper of many fake Maestri, and although some of them revealed to be very weak both scientifically and as human beings, it is the authors' strong opinion that, without an interaction between Maestri and pupils, science is bound to have serious growth and transmission problems: the interested reader can fruitfully discover in ([15]) which are the consequences of the loss of continuity of the chain maestro/pupil in the transmission of knowledge.[31]

2.3.4 Some typical frauds conceived to get personal advantage by exploiting academic prerogatives

To discuss about frauds one has to describe the set of rules against which they are conceived. Of course there is a fundamental question to be asked to all those who believe that one number, two numbers or even n numbers (with n rather large) may be useful to characterize efficiently the quality of a scientist. The question is: why do you refuse to READ the papers of the candidates for an academic position, to TALK with them during an interview, to ASK them politely scientific questions during this interview ? In other words: why do you believe that Pier della Vigna was wrong?

Selecting the new professors by means of a public interview and a selecting committee: *i pubblici concorsi* i.e. public competitive exams
Of course one wants to avoid that a candidate who is not suitable could get a

[31] Also an interesting analysis of the consequences on the structure of human societies of the degeneration in the maestro/pupil relationships due to the diffuse lack of consideration about the capabilities of the Maestri can be found already in Plato The Republic Vol. VIII 562-563 Translated by B.Jowett, Vintage Classics (1991). Many pupils of some of the authors (and many young persons self-declaring to be scientists) refused to undergo to the discipline needed to become a serious and dedicated scholar, by writing carefully papers, under the supervision of more experiences scientists. They refused to learn how to describe well-checked results, after having searched for many hours in the available literature, to be certain that nobody else had already discovered the same ideas, models, techniques. Their claim is that this old method is surpassed and that this double check is a way for stopping the advancement of science (and creativity of young researchers). Many of these students managed to reach very huge values for all their bibliometric indices, as they cured to belong to the right citation networks. However the simple fact that some of them have not clearly understood, for instance, why there is no rational number whose square is equal to the number 2, this simple fact represent the unstable foundation of all their many and many times cited papers. The fact that one manages to be cited many times has absolutely no meaning for what concerns the scientific value of his own papers. Concerning the importance of the role of the Maestri and their role in the imposition to pupils of the needed discipline to abstraction the interested reader is invited to refer to A. Gramsci: In Search of the Educational Principle translated by Q. Hoare and G. Nowell Smith in 1971. Gramsci claims that: ***"it will be necessary to resist the tendency to render easy that which cannot become easy without being distorted.*** "

permanent position as professor. To this aim since the very first years of life of the European university it was established that such a tenured professorship had to be attributed at the end of a procedure regulating a public competitive exam.[32]

Organizing networks of academic power distributing favors In order to assure that public competitive exams are fair many different techniques have been conceived: all of them can be overcome. However some rules can be conceived (see following paragraph) which can limit the abuses and can lead to relatively fair selective systems. Two were the most frequently used tricks used to control *a priori* the result of a *pubblico concorso*: i) the committees of different competitive exams work in parallel. The father (or husband, or wife, or mistress, or lover or friend) X of the candidate x is president of the committee A, while the father (or as before) Y of the candidate y is president of the committee B. The candidate x is elected by the committee B, and the same happens to y relatively to the committee A; ii) the member X of the National Academy wants that x be the elected professor by the committee A. The president Y of the committee A is elected member of the National Academy because of the efforts of X. Actually one needs to pay at least four full professorships to get as exchange one position in the National Academy (if the Nation is large enough).

The French and Italian solutions to the frauds[33] National evaluating committees and local committees must be composed by reasonably large number of members. We put forward a conjecture here, suggested by an analogy which has been accepted by the Italian legislator. **The selecting committee in a competitive exam must have the same attribution as a criminal jury** i.e. *body of people (typically twelve in number) sworn to give a verdict in a legal case on the basis of evidence submitted to them in court.* Exactly as happens for juries it has been longly experienced that selecting committees formed by a too large number of members starts to be subjected to social dynamics where the merit is not anymore duly taken into account and the decision process can

[32]What in Italian is called *pubblico concorso*, can be ruled by more or less rigorous laws: the committee has to be constituted by a relatively large number of members, they must be all at least peers of the future professor, having a rank equal or higher to the one attributed to him, they should be recognized experts in the discipline to be cultivated by the new holder of the position, they should be selected in the widest possible set of professors enjoying the given requisites. The committee has to vote to elect a professor after a suitably long debate and has to be composed during all its works by the given fixed number of members: it has to be a *collegio perfetto* i.e. a committee whose member participate always to all activities and actions of the committee. If some member is absent the committee cannot operate and must wait until it is perfect, i.e. complete. No member can be relative, or affine to a candidate up to the fourth degree, no member must have had usually lunch or dinner together with one of the candidates, no member must live in the same house with one of the candidate. If one member of the committee authored some papers with one candidate then the other members of the committee must recognize that the candidate's independent contribution can be isolated from the whole content of those papers, otherwise such papers cannot be considered in the evaluation process.

[33]Not always applied strictly in France and very rarely applied in Italy.

be driven not by a discussion based on logics but simply on emotions. In these context populism and demagogy become dominant. It is a challenge for the theory of games to mathematically prove this well-documented conjecture. A first instance of reasonably fair procedure: imagine that one position is assured to a candidate after a competitive exam whose selective committee is composed by sixteen members, chosen from at least six different universities, with at least four from foreigner countries. Imagine that only one position can be assigned because of the decision of the committee and that the committees needs to proceed to the election of the new professor in five weeks after its first meeting. Imagine that the candidates must possess a habilitation to the role of professor, and that this habilitation is publicly conferred by a committee whose member individually stated that the habilitated person has the required scientific level. Even if the possibilities of malpractices could be still possible, such a procedure has a very high percentage of fair outcomes.[34] A final instance: choose randomly among the professors of a discipline the five members of a selecting committee for a given and unique professorship. Even if many scientists doubted about the efficacy of such a procedure the results of the election process were astonishingly of high quality in many cases. Of course when the power groups still managed to coordinate the actions of their members distributed in different committees then the results were, as usual, very disappointing.

Counting published papers (and then citations) Imagine to have a system in which the scientific quality of a candidate to an academic position is estimated by simply counting the published papers. This system was more or less used in Europe and in the USA immediately after Second World War. At the beginning it was sufficient to publish in a whatsoever journal: also a local journal controlled by the PhD supervisor of the author was suitable. Sometimes the journal could be also the newspaper of the local Dioceses which together with a paper about integro-differential equations published a paper about the first years of life of Saint Paul. Then it was decided that the journals had to be dedicated only to scientific papers, afterwards the requirement was strengthened and the published papers had to have a very specific subject and the orthodoxy of the publishable subjects had to be surveilled by a highly qualified editorial board. The idea was the following: if a candidate managed to persuade an editorial board about the quality of his papers then we do not need any further check. The authors are considered good by respectable experts and therefore

[34] Another instance: imagine that a committee of nine members is elected with a secret ballot by 120 professors belonging to the whole country, i.e. all the professors of a given discipline. Imagine that these nine members must select 25 chair holders which will subsequently apply to different universities to get their tenure and that there are 150 candidates. The selecting committee can interview 75 candidates, asking to each of them to discuss publicly for one hour about their scientific research and, after 24 hours, to give a lecture on a topic randomly chosen among a set of topics recognized as fundamental by the whole scientific community. Finally the new chair holders are elected with a secret ballot by the nine committee members after a long and well-documented discussion, which produces some written and public judgements. Again, even if malpractices are possible, they, on the average, become not so frequent if the previously described rules are applied.

they deserve a position. This reasoning is rather well-founded if there were certainty about the ethical behavior of the members of the editorial boards[35] and if there were a social control and sanction against journals, editorial boards and the reviewing single scientists who do not carefully judge the submitted papers.[36] **In any case if the reasonably small numbers of members of a selecting committee behaves ethically then the system envisaged by Pier della Vigna works perfectly**.[37] On the other hand if persons do not behave ethically then it is always impossible to find an algorithm which can replace the work of a selection committee. This simple reasoning seems so clear to the authors that they do not see how so many persons want to ignore it: you cannot expect ethical behavior in citation practices and assume unethical behavior only in the peers' selecting committees. Maybe this subject should be a case of study to be proposed to Trivers, the author of the beautiful book [18]: those who believe in citation indices are victims of a typical self-deception process, if they are in good faith, or they play the game of deceit, in the other case.[38]

Organizing networks of members of editorial boards The immediate counteraction against the criterion of counting published papers is to establish a network of members of editorial boards exchanging favors.[39] In such a situation the battle for getting positions becomes a battle for controlling directly or indirectly editorial boards. Until the system was based on the number of published papers it was very difficult to have a paper accepted in a journal were the author had no friends or supporters. Then a large pressure was exerted on editorial boards to stop the unethical procedure of rejecting papers

[35]Not only the ethical behavior but also the scientific competence of the board is necessary and yet not sufficient!

[36]The discussions about ethics and ethical behavior has been raised by all the supporters of one of the algorithmic systems based on bibliometric indices used for evaluating scientific quality: they claim that ethical behavior must be assumed in every scientist who is writing a scientific paper. They claim that it is possible to demand to every author to behave in an ethical way while choosing the papers which he wants to cite and that we can impose to every editor-in-chief to check if the authors who are publishing in their journals adhere to highly ethical criteria. It is not clear how these supporters would like to check the good faith of the citing authors: maybe they want to use the lie detector or more modern brain scans (even if up to now these scans gave very good results, they are not ready to be used in courts! see http://www.scientificamerican.com/ article/to-tell-the-truth/).

[37]Consider that as they are not many hundreds (as are the authors who cite the papers of a candidate to a professorship), but at most ten or eighteen then the use of a brain scan for them is less difficult!

[38]It has been remarked that in the Università di Napoli, where academic deceit and self-deception has been practiced for at least 750 years, nobody dares to seriously support the recent blind belief on bibliometric indices.

[39]In this case X publishes the paper of the friend y of Y and Y publishes the paper of the friend x of X. The reviewing process becomes a formal rite in which the reviewers are more or less pushed to write what the editor (who pretends that he is asking for their advice) really wants. One of the authors, having found the evidence of plagiarism and fundamental mistakes in one paper which he was reviewing, communicated his opinion to an editor-in-chief. This editor had a brilliant idea: he asked to the reviewer to contact directly the author for finding an agreement !!!

which indeed deserved to be published. As a final result all papers (also copied ones, also those containing no new result, also those who are a clear plagiarism of other papers) are accepted for publication. As a further consequence the system is flooded by useless and contentless documents which make difficult the search of relevant results, if a true scientist needs to know them (see e.g. http://www.theguardian.com/technology/shortcuts /2014/feb/26/how-computer-generated-fake-papers-flooding-academia; http://pdos.csail.mit.edu/scigen/ or[17]).

Counting citations of published papers When the system of controlling the flow of published papers became deeply rooted in too many academic disciplines somebody had a clever idea. He wanted to measure the different impact of published papers and scientists. How to measure such an impact? Simple. By counting the number of times which each paper by a given author was cited. This seemed a revolutionary solution to nonethical behaviors which always caused problems to the recruiting system of Western universities. Easier than the Egg of Columbus! And indeed this seems a brilliant idea at first sight. Unfortunately this medicine resulted to be worse than the disease which it wants to care. What happened is that, to certify the number of citations obtained by an author, some specialized and commercial companies invented smart (?) software systems and started selling them.[40] A more evident phenomenon started: the number of publications increased, the number of total citations was enormously inflated by career-adaptive behaviors (can we qualify them as nonethical or, we should say, simply human?), the income of commercial publisher increased because of the increase of published citing articles and the authors were pushed to publish more and more, sometimes paying for transforming their papers into so-called Open Access papers.[41]

Organizing networks of authors exchanging citations and practicing self-citations Because of the historical process described in the previous paragraphs, to publish a paper became recently very easy and the number of published papers became a nearly useless parameter for measuring the productivity, the originality and the scientific value of a scientist. However the neurotic need of measuring the scientific value and originality by means of a single number

[40]Here the tragic role of apostrophes in the family names became relevant to our discussion and determined the career of many scientists. Even some States decided to pay at very high prize these private companies to get a certified statement about these magic numbers (citation obtained, h-index and similar amenities). Some gossip started immediately after: it is believed that some Asian (or South Italian?) company has started to invent fake citations so altering the bibliometric count of some scientists (of course being suitably rewarded with relatively large amount of money).

[41]The most negative effect has been the enormous increase of expenses suffered by the academic institutions to get useless or dangerous services, as those allowing for the count of any kind of meaningless citation or bibliometric indices. A very dangerous side effect of these expenses is that many young scientists cannot get a reasonably paid position or a well-deserved tenure because the money for their salary is, instead, spent to enrich commercial publishers. Consider also that the main part of the work for these publishers is mainly done by those who are exploited by such a twisted system: i.e. serious scientists.

demanded a kind of satisfaction. This satisfaction became more and more frequently linked to a new number, which was bound to replace the number of published papers: the number of citations which each author managed to obtain. [42] There is a systematic strategy which needs to be applied to induce young authors to cite a series of papers of elder authors: this strategy will lead the senior authors to get funds which they will then use to finance the positions of the younger ones. For a while self-citation practice was tolerated: then ethical issues were raised and therefore it became more ethical to induce (very politely!) people to cite papers which nobody actually had read and whose content may range from being useless to being wrong.[43] There are many legends in science. A result is attributed to a paper, but when one reads this last paper there is no trace of that result: somebody was lazy and powerful at the same time, and started attributing to a friend an original result which the friend never imagined to include in his paper. Sometimes the author of a paper decides, in good or bad faith, to claim that in one of his paper, published 20 years before, a result was indeed proven: his network of clients starts citing this paper as if this result were included there. Nobody check or wants to discover, by simple inspection, that in that paper such a result simply does not appear.

Counting many and always more bibliometric indices The delirium of omnipotence of experts in bibliometrics (or simply their need of justifying their existence and their careers) reached recently some unarrived peaks in the lack of sense of reality.[44] Moreover they wanted to introduce a quality label to every journal (based on its impact factor, for instance) and they invented weighted averages of the variously introduced bibliometric indices. So that for instance: the citation from a paper published in a journal with a high (calculated) impact factor will be heavier than a citation from a paper published in a journal with less (calculated) impact. It seems that we are in a multidimensional game with

[42]The commercial publishers are very good in exploiting these neurotic behaviors of frustrated scientists seeking for academic recognition. A scientist to be recognized does not need to be read. He simply needs to be cited! In order to be cited he needs to occupy a preeminent position in editorial boards and needs to be a strongly working reviewer. He needs to write many papers, very frequently and he needs to review many other papers to advice to the authors how to cite his own papers. He also needs a network of clients who cite his papers under his direction (as in order to get high bibliometric parameters a random citation strategy may be useless).

[43]These networks of clients are becoming very large: sometimes one can perceive in action a simply evolutionary and darwinian selection behavior which can be even not completely conscious. One can find himself in the center of a *tit for tat (Tit for tat strategy: the idiomatic English expression means "equivalent retaliation". For more details see e.g.* [7]) chain of favors: a suitably cooperative, even relatively small, group of scientists behaving in a coordinate way may manage to induce a much larger group of authors to cite a given set of papers, even if it is clear that nobody read any of them.

[44]They started to count the: i) total number of citations received by an author, ii) total number of citations from books or chapters of books, iii) total number of papers cited by an author in all his publications, iv) number of papers cited more than ten times, v) number of citations without self-citations, vi) number of citations in papers whose authors were not co-authors of the cited author, vii) number of papers of one author which were not cited at all, and many more.

varying payoff functions, and that indeed (see also the beautiful essay [10]) the Emperor is naked [45]. It seems unavoidable that, until a perfectly honest robot will not be built, who is also capable to understand scientific creativity, the only effective way for trying to select clever scientists for professor positions is to nominate a *collegio perfetto* (see again the beginning of the section for its definition).

Organizing networks of authors using algorithms for citing, publishing and reviewing In order to be ready to confront the new challenges presented by the new bibliometric parameters the authors have heard about networks which are being organized by means of computer driven strategies. An online software will control Google Scholar, and other indexing programs, and this software will warn the existing networks about the appearance of new organized entities which may menace the supremacy of the existing ones. **Of course nobody can prove that a given flow of citations in nonethical. All involved agents will declare that the papers which they are citing appeared to their spirit as the source of new light opening their mind.** However the strategic minds of these networks will immediately discover if a given author is being cited more than he had been usually and will try to fight the new entry, exactly as done by incumbent companies in monopolistic or oligopolistic markets. Therefore, after the publication of a paper by an author who does not belong to a given network the leaders of the network will submerge the new entry with many papers having similar titles and subject (sometimes even including entire parts of the paper to be submerged). All these papers, except one (to which all others will refer), will not cite the paper which is trying to enter the market. This unique paper citing the original source will cite it incidentally, without crediting its contribution at all. These actions are so well coordinated that it is impossible to sustain that they are casual: it is clear that they are the effect of a coordinated action. The oligopolistic or monopolist networks behave like those cartels aiming to control completely the production of scientific papers: one must be accepted by the owners of the cartel if he wants to produce the goods controlled by the cartel. [46] Usually laws are taxing incumbent monopoly to foster new entries: in a completely similar way, sometimes commercial publishers completely renewed editorial boards in one night in order to allow to new agents to break the monopoly in one scientific field. It

[45] We refer to the famous short tale the *Emperor's New Clothes* by Hans Christian Andersen.

[46] The parallel with the similar economic phenomenon are really striking: the incumbent monopoly or oligopoly tries not to allow new entries in the market which they control. Many years ago (now the authors are allowed to publish some papers, but this right was earned after many painful battles) the authors tried to publish a paper proving the well-posedness of a particular free moving boundary problem. The incumbent monopoly, by means of many different reviewers, acting independently in different journals and nations, did not allow for the publication of that paper, which was subsequently used a part of a numerical paper, dedicated to a more general problem. When a new entry must be stopped even negative reviews based on fake arguments may be used. A statement which has been used many times is: the reviewer does not believe that the result is correct. Now such a statement without a logical argument cannot be accepted. Well: aforementioned reviewers state, if one asks to give more details, that they have no time for this kind of things, as they are too busy with their own research.

is somehow ironic that the worse and more stringent monopolistic controls of scientific production are broken by the need of commercial publishers to enlarge their market by including some new entries in the scientific arena: of course the commercial publishers do not worry about science and advancement of knowledge, they worry only about income. If a monopolistic cartel is strangling too much the development of a given subject by preventing the entrance of new authors, new research groups, new ideas in the stronghold which it is controlling, then the sales of related journals, books and papers will not increase as they should be for being rentable. Therefore, for the wrong reasons, sometimes commercial publishers behave in a positive way. **However the only institutions on which we must rely for the advancement and protection of science should be those Universities and States, which follow the example of Frederich II Hohenstaufen.**

2.4 Bibliometrics as a tool in the strategy to control supranational committees for research financial support: the most modern academic fraud

Supranational entities played an important role in the life of academic institutions since their foundation in Middle Age.[47]

Are these unjustified privileges ? Here it is not needed to delve into juridic details, which are, however of great interest by themselves, as they establish the rules of the games played by the agents of the various competitions for tenures, power and economical resources. Instead what has to be explicitly remarked now is that the privileges assured to the professors during the preceding centuries included the possibility of supporting and selecting younger collaborators and the capability of spending financial resources in order to establish laboratories or to built new devices and machines. Once somebody had been finally chosen as a professor he was finally free to invest his intelligence and skill to invent, teach and realize his scientific dreams.[48] On the contrary, more recently, all the

[47]Pier della Vigna was embedded in a political system where the Emperor tried to impose a supranational legal entity to small States fighting to keep their sovereignty and where the Pope tried to impose his own control by means of the concept of legal power emanating from supernatural inspiration. The institution of Universities was decided always at a local level, even if both Paris and Bologna Universities needed a supranational acceptance for being established in a stable way: Paris was recognized by the Pope, Bologna was protected by the Emperor ([20]). However every University kept its own right to choose and support his own professors until the establishment of modern Nations. In Italy and France to hire a professor became a National affair involving the whole academic community of the two countries. In Germany each University is an independent kingdom in which each Professor is a feudal Lord nearly completely independent from the others. In USA and UK there is an intermediate situation, in which the state plays a more direct role in the selection of Deans or Presidents of Academic Institutions.

[48]For instance Vincenzo Brunacci, after having been selected for the important chair of Matematica Sublime at the University of Pavia, was allowed to write a monumental textbook (which has been used for at least 70 years in Italy: this textbook was used also by his students in Engineering and its content is considered nowadays too complicated in many engineering

activities which have to be regarded as essential in the leadership required to a university professor have been considered more and more often to be unjustified privileges. Instead, in modern times, a professor is assigned a different teaching duty every different year. In this way he is not able to think about the best way to teach and he is not allowed to write a carefully pondered textbook. The reason is clear: if somebody (e.g. Brunacci) writes a book, after years of well-considered teaching experiences then that book will be nonstandard, innovative, nonconformist. This will mean that aforementioned book will be difficult to read, as it will require a great intelligence investment to the reader. What is astonishing is that the most violent opposers to the new books are not the students, but the colleagues of the professor who dared to write the novel textbook.[49] More: if one professor is not allowed to choose his coworkers then his research and his teaching will be less effective and his potentialities will not be completely exploited for the advancement of science. Finally, if a professor is not allowed to use, conceive or construct new devices in an efficient laboratory then the capability of science to be a motor of technological advancement will be dramatically impaired. All these prerogatives of a professor were finally questioned, and at the end, except in few happy institutions in the world, to become a university professor simply means to have a salary and to be obliged (by his more-politically-skilled colleagues) to give lectures in a way which has been decided by others. In other words, all the innovative thrust potentially given to science and technology by a creative mind is blocked at the origin by a well-established conformist network of dull (but effective in getting social consensus) spirits.

In modern times a professor must apply to supranational entities to get the financial support which he needs to push forward his research. In order to get the needed resources to deploy his creativity, an innovative brain needs to fill up very complicated forms to be submitted to NSF or to ERC or to some other entity.[50] This has been conceived in order to oblige (sic!) tenured professors to remain active by being continuously submitted by a peers' reviewing process. The life of an active researcher then becomes a continuous work of public relationships, conference participations and colleagues flattering.[51] Many persons seriously interested in science and knowledge have

faculties in Italy) in mathematical analysis, to buy all needed instruments for establishing an experimental laboratory (he was also teaching to Engineering students) and to select his assistants (four of them continued his work after his premature death). Remark that we used the word: allowed.

[49]The authors had the honor of being students of Federico Cafiero, one of the most gifted Italian mathematicians of the XX century. His textbook was innovative, deep and formative: but difficult to read. Finally, when Cafiero died, his opposers (i.e. his own colleagues) managed to persuade his successors not to use his textbook anymore, and the level of the students in Physics of the Università di Napoli decreased dramatically

[50]Also China and Russia have chosen to establish such a global entity: the National Natural Science Foundation of China (NSFC) which is directly affiliated to the State Council for the management of the National Natural Science Fund and Russian Foundation for Basic Research.

[51]Never write a review which is negative: the members of the network which supports the author of the negatively judged report, paper or project will repay you back immediately

found an ambiguous compromise: they accept to be used by the power networks. When it is necessary to destroy a competitor they examine carefully the papers of the enemy to be eliminated and apply rigorous merit criteria. These persons believe that in this way they manage to exert a quality control of the academic body. Instead they are like contract killers: they destroy somebody to leave the place to somebody else who in general is much worse. At the end, this continuous playing to the game of *the conquer of power in academic institutions* is relenting research and hence the advancement of science and technology.[52] Continuous peers' reviewing has a tragic consequence: every decision is taken on the basis of citation indices, which, on their turn, are decided by means of the wishes of those rulers who, more or less secretly, control the citation flows from one group to a restricted elite of eminent personalities. Their eminence consists in their capability of not being seriously evaluated in any occasion or situation. Those who wanted to avoid arbitrary decision of few privileged professors managed to make the situation worse: indeed Vincenzo Brunacci or Federico Cafiero were openly and publicly choosing their assistants, they were deciding to write a book and publicly supporting the views expressed in it. They were publicly deciding which instrument had to be constructed and which technology deserved attention, while those who control citation flows remain in general hidden. Nowadays nobody decides anything: it is the people who decide. How do the people decide? By citing! This populistic view of science is deadly, as it is deadly for democracy.[53]

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cutting your resources or rejecting your own papers or those of your students. Indeed the blind review process is corrupted and as the reviewed authors would usually know who is the reviewer they can work to ruin his career in revenge. Instead of being worried about scientific truth one has to be worried about opinions, tastes, trends and power networks. If one is concerned about the intrinsic merit of the scientific efforts presented in projects, papers and reports then he is quickly considered a person with social problems, having a kind of disorder of mood or personality.

[52]Continuous peers' reviewing of everything (see also [10]) is becoming pathological: one is required to be evaluated for his lectures, his papers (on a yearly basis), his doctoral students, the conferences which he has organized or to which he has participated, the number and quality of lectures and seminars which he was invited to hold, the number of months of invited professorship with which he was rewarded weighted with the quality of the inviting institutions and so on, with crazier and crazier quality parameters. However, the king of the parameters has been chosen: citation index. Now the declared spirit of those who invented this crazy continuous political game, replacing in the mind of people true research efforts, is to assess quality. As peers' reviewing is essential then they have invented a committee for everything. For advancement in salary and career, for distribution of resources, for distribution of teaching duties and so on. The life of serious researchers has become a hell: one has to apply to get the money to buy a computer or to invite a colleague. Of course, professors who are not interested in research have the time to get consensus (and also are able to appear friendly to mediocrity) and they form and control all kind of committees. However no-one wants really to read papers and judge them: on the other hand, everybody can count natural numbers, also those who do not know that square root of two is not a rational number.

[53]Actually, the true decision makers are like the obscure and mediocre secretaries of the communist party cells. It seems that the only remnants of the Soviet power organization, which operates without any institutional control by means of democratic rules, can be found in academic bodies.

Frauds in supranational institutions Consider a supranational institution SI. There are N nations or state or regional entities R_i (where $i = 1, ...N$) gathered to form SI. Of course every R_i has its own representative in SI and pays a share Q_i in the financing of SI. One could expect that a fairness (although non meritocratic) criterion for distribution grants will be easily established: the projects presented by academic bodies from the region R_i will have more or less a success rate equal to Q_i. However it has been experimentally observed that there are regions which systematically get less money compared with the amount which they pay.[54] Imagine that the committee which is distributing grants has a turnover in its composition: one third of its components is changing every year, and a single member remains in charge for three years. A given representative of a given region may organize the fraudulent strategy based on the following actions: i) he finds an agreement with (hidden) citation drivers to direct citations towards some candidates $C_1, ...C_n$ to be grant holders (one of this candidates , say C_n, being himself); ii) he accepts for his region a share of financed projects amounting to 70% of Q_i in change of the absence of any form of control exerted by the other regions representatives on his own choices; iii) he favors during his own term the financing of the candidates $C_1, ...C_{n-1}$ (if in the meanwhile $C_1, ...C_{n-1}$ also belong to committees where they can repay favors immediately, this is also welcome); iv) when he ends his term he is replaced by a supporter of an allied citation network (or maybe one of the eminent scientists belonging to the set $C_1, ...C_{n-1}$) and he gets his own (possibly dull and very conformist) project financed; v) the representatives of the other regions are happy because they can finance more projects, which, moreover, in general are of good quality. **Nobody is then surprised if the region which behaves this way will become less and less technologically advanced and if its scientists will emigrate. Nobody is surprised if the richer regions become richer and richer and the social, cultural and economical gap between richer and poorer becomes larger and larger.** This fraud, never observed before the institution of supranational entities, but observed in a primitive form in regional States with weak central State institutions, is fundamentally based on the lack of responsibility which arises when instead of the personal involvement of well-specified group of decision makers the rules decide to rely on what are claimed to be objective bibliometric measures. Instead Pier della Vigna method still remains the most effective one: SI has to establish local chairs, permanent and well-financed. Then serious public selecting committees must select among habilitated scientists. Once a scientist becomes a professor then he has to be free to pursue his life research project, with the needed financial support. Of course many holders of these positions will not behave in the best possible way: some will cause problems, some will favor their friends. However if the rules governing the selecting committee are serious enough then the highest possible

[54] This phenomenon has to be explained and need to be investigated. A naive explanation could be that these regions which pay more than what they get back in the form of financed projects, these regions simply are scientifically weak. Instead a close inquiry may show that this is not the case: the true reason instead is that they have social traditions in which there is no strong social control on the behavior of public officers.

percentage of honest, creative and nonconformist professors will get the positions. They, as happened in the centuries preceding our era, will lead humanity towards progress. This was indeed demanded by Frederick II Hohenstaufen to the professors of the Università di Napoli, now named after him: they were asked to direct themselves and their pupils AD SCIENTIARUM HAUSTUM ET SEMINARIUM DOCTRINARUM[55].

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3 Nash Equilibria and Pareto Optima in the game for academic power

Groups of primates continuously fight for attaining and managing power. Scientists are not an exception. What is exceptional for scientists is the motivation for which they fight for power.[56] Scientists always claim that they are working for future generations. However, very often those scientists who are more gifted to get power in academic institutions are not able to direct science in the right directions. The theory of games supplies a wonderful tool for understanding many phenomena occurring in social groups, including those which lead scientists to care about bibliometric indices.[57] **Those enlightened politicians and statesmen who will want to solve the challenging problem of finding the right rules for optimizing the behavior of scientist to get from them the best possible for advancement of science will need to design the rules of a competitive/cooperative game.** This game could be called: *The search of academic glory.*[58] We believe that the statesman who will be willing to improve, in a substantial way, the solutions which we wanted to attribute to Pier della Vigna will need the help of (honest!) computers, to be designed e.g. by following the ideas described e.g. in [3]. Indeed, it seems that Browne and Colton (or some experts in the theory of games) should consider the possibility of proposing to lawmakers the use of their theoretical techniques

[55]That is: towards a source of science and a seedbed of doctrine

[56]In fact, they openly declare that their seek of power is needed for the advancement of science, whose ultimate aim is the advancement of the well-being of humanity, as a species, in the long run. In this, they differ from many politicians, whose explicit aim is to produce well-being now and here. There were some politicians in history who claimed to have more enlightened aims, but nowadays it seems very difficult to find some who openly declare to have such high objectives.

[57]There is a trivial observation which needs to be presented now: there are scientists who collect citations behaving in a very similar way as children and boys who collect football or rugby players cards. A kind of obsessive compulsive distress leads them to search for reassurance in operating to get citations for their works.

[58]However the game designer will be obliged not to forget that the players of this game are not so dissimilar to the chimpanzee Yeroen (the main character of many power fights in the Arhnem Zoo, see De Waal [6, 4]). Scientists have families, wives, husbands, children, mistresses and lovers, they need money, heating, houses, holidays. They can be wrong in good faith, when believing that a theory is suitable for describing some phenomena, and they could be bribed to make the other humans believe that a fake theory is indeed true.

for conceiving appropriate game rules for academic institutions. This is exactly what is needed for rationally finding the right laws to rule an academic body.

3.1 Nash Equilibria

In the opinion of the authors the only way to rationally understand the problem discussed in the present paper consists in deeply understanding the fundamentals of game theory[59]. **To the knowledge of the authors there has been no serious attempt to apply game theory in a systematic way to the design of the procedures regulating the functioning of academic bodies.** The theoretical effort should be started immediately and the outcome should be the guidance of all legislators[60]. In game theory, the Nash equilibrium is a concept relative to a non-cooperative game involving two or more players, in which each player is assumed to know perfectly the choices of the other players. Each player has a set of possible decisions or choices, i.e. the set of possible actions which can be chosen. Once all players have chosen their actions there is a payoff for each of them, i.e. each player suffers or enjoys the consequences of the actions (choices) of all the players, including himself. In the theory of Nash Equilibrium it is assumed also that all players have a perfect knowledge of the all possible payoffs and that a player can use a mixed strategy: this means that he can decide, with a given probability distribution, to vary his actual choice in the set of the possible choices.[61] Game theorists use the Nash equilibrium concept to analyze the outcome of the interaction of several decision makers: it is assumed that when the decisions are repeated in a long time interval (i.e. when the game is repeated in a relatively long time interval) then the Nash equilibrium mixed strategy is the one which is finally adopted and which remains stable in time. In other words: it seems that being able to characterize mixed Nash Equilibria could provide a way of predicting what will happen in those situations where several people or several institutions are making decisions at the same time, if the outcome of their decisions depends also on the decisions of the others and if the rules are kept fixed for a suitably long time interval[62]. The

[59] This theory was founded by the Marquis de Condorcet (indeed he started his studies in order to design the best possible political institutions) and then developed by many scientists, among which three names seem to be the most outstanding: Pareto, von Neumann and Nash. It supplies a very powerful investigation and predictive tool in the description of the behavior of social groups. The interested reader is invited to study the beautiful texts [7, 14] to get some further details about the concepts which we will try to sketch here.

[60] The authors want to recall that during the French Revolution the mathematician Marquis de Condorcet was explicitly charged by the Assemblée Nationale to find the optimal way to organize the democratic institutions and that his studies were carefully taken into account.

[61] If each player has chosen a given mixed strategy and no player can benefit by changing his mixed strategy while the other players keep theirs unchanged, then the current set of mixed strategies and the corresponding payoffs constitute a Nash equilibrium. In Nash equilibrium no player has anything to gain by changing only his own mixed strategy (however it could be possible that a cooperative change of strategies may increase the payoffs of some or all the players).

[62] One could say that in Italy the laws are changed so often willingly: the legislator seems to have the intention of favoring the predatory behavior of some academic agents in order to not allow, against them, the application of tit-for-tat strategy. Indeed it could seem that

deep and fundamental concept which is underlying Nash's results is the following: **it is not possible to predict the result of the choices of multiple decision makers if one analyzes each of those decisions in isolation. Instead, one must determine what each player would do when he is able to take into account the decision-making of the others.**[63]

Some definitions: game, strategies, mixed strategies A game is a set of rules which determine the consequences of the choices (strategies) of the agents in the game. Each agent has his own set of possible choices and for each set of ordered choices (one for each agent) the game rule supplies the distributed payoffs. If the choices must be repeated in time (e.g. if the players gather periodically in an academic body to govern the University) then the players may decide to have a probability distribution regulating their choices. In this case they are choosing a mixed strategy.

Informal Definition of Nash Equilibrium. A set of mixed strategies is a Nash equilibrium if no player can improve his payoffs by unilaterally changing his or her strategy.[64] The Nash equilibrium may sometimes appear non-rational in a non-player perspective which examines the interactions among the players. This is because it may happen that a Nash equilibrium is not Pareto optimal (see infra). A Nash Equilibrium is the state in which a game falls when the players do not accept to cooperate for the common well-being: Pareto Optima are states in which cooperation renders payoffs maximal.

What happens if an academic group falls in a Nash Equilibrium: the tragedy of the commons. Considers the set of members of deliberative academic bodies: for instance the departments of mathematics. Every decision of the academic body is the result of a vote, and every vote has a consequence on the payoffs of every member of the department. Assume that, instead of pursuing the well-being of their society, each player, even the most skilled mathematicians of their generation, starts choosing a strategy aiming to his own personal immediate interest.[65] The departments will slowly fall in a

legislator, in Italy, is himself a player of a metagame: the metagame of the destruction of what was one of the best educative systems in the world, because of its ancient traditions and the relative effectiveness of the rules which initially regulated its functioning.

[63]Nash equilibrium has been already used to analyze for instance: i) the output of confrontation and hostile situations like war and arms races (a game developed in this context is the famous prisoner's dilemma), ii) how conflict may be mitigated by repeated interaction (the mixed strategy involved in the tit-for-tat behavior in citation strategies gives an example of such a conflict mitigation to attain a form of cooperation), iii) to what extent people with different preferences can cooperate (this is the case of the game: battle of the sexes), iv) whether in a game it is worth to take risks in order to achieve a cooperative outcome (as happens in stag hunt), v) the outcome of efforts exerted by multiple parties in the education process, vi) regulatory legislation such as environmental regulations (recall the tragedy of the Commons).

[64]To be more specific: imagine that each player is told the strategies of the others and knows them perfectly, and is persuaded that the strategies of the other players will not change. Assume that each player asks himself: "Can I benefit by changing my strategy?" If one of the player can answer "Yes", then that considered set of strategies is not a Nash equilibrium. But if every player does not find convenient to switch his strategy (or is indifferent between switching and not) then the considered set of strategies is a Nash equilibrium.

[65]In few years the departments will be full of persons having the same family names, of

decadence process, the society will discover how stupid are these mathematicians who pretend to be deep and clever but actually are not working for the future generations but simply for their own children. That society will soon decide that mathematics is useless and will close all its departments of mathematics. To be a mathematician will become an insult and nobody will try to become a mathematician. Unfortunately after some decades the same society, deprived of his rational mind, will experience a dramatic collapse of its technological capabilities (see [15]).[66]

3.2 Pareto Optima

In presence of games allowing for a cooperative behavior, the players can increase simultaneously all their payoffs by simply coordinating their actions. Of course the individuals will be lead to a cooperative behavior only if they can envisage a collective payoff for their efforts.[67] The problem of understanding which are the configurations such that the well-being of all players can be maximized has been considered by a famous Italian economist, Vilfredo Pareto. He intended to give a contribution to human capability of designing rules in order to increase the societies' well-being. **Pareto efficiency, or Pareto optimality,** is a state of allocation of resources (i.e. distribution of payoffs) in which it is impossible to make any one individual better off without making at least one individual worse off. The concept has obvious applications in the studies relative to the behavior of social groups in which a possible cooperative behavior may be adopted and plays a crucial role in social sciences. Given an initial allocation of goods among a set of individuals, a change to a different allocation that makes at least one individual better off without making any other individual worse off is called a **Pareto improvement**. An allocation is defined as Pareto efficient or Pareto optimal when no further Pareto improvements can be made.[68] Therefore the concepts of Pareto improvement and Pareto optimality are simply establishing some necessary conditions for characterizing acceptable cooperative actions or

incompetent husbands and wives, mistresses and lovers. In practice, everybody thinks: "I am clever enough to compensate the eventual lack of competence of my beloved".

[66]This process has been observed, in many different context, in what has been called the tragedy of Commons. In [9] it is seen how individuals, acting independently and rationally, pursue what appears to be in the short term each one's self-interest. This behavior contribute to the ruin of the group as a whole, and therefore to each single individual's ruin, as it is contrary to the whole group's long-term best interests by depleting some common resource. It is clear therefore that well-organized societies need some rules which control the individuals' actions so that their behavior is more suitable for attaining their own long term well-being.

[67]Frederich II Hohenstaufen was named Stupor Mundi because his contemporaries understood that his actions were aimed to obtain payoffs in a time range of centuries and because he managed to persuade many different eminent persons to coordinate their actions in order to get a common objective, to realize a common vision. He managed to make some of his vassals to share his dreams and his vision of the world, aimed to the advancement of knowledge and science for the well-being of all human beings.

[68]Of course, in real life applications, as it is well-known that all primates (see [6, 5, 4]) are instinctively averse to inequity and sympathetic with others' sufferance then the increase of players' well-being cannot be easily obtained when it causes others' (non-players) great distress or in presence of too largely different and not balanced payoffs.

configurations. Imagine to have a group of academicians who belong to a selecting committee: each choice of the committees, as a result of the choices of the single individual members, may produce for each member a payoff. Nobody is so naive to believe that all members will have their maximum reward if the most clever candidate gets the position. Each member will have his own preferred outputs, which will include, in general, some very personal issues. The true problem to be solved in this context is the following: how to induce the considered academic body to choose the candidate who is the one most useful for science, i.e. whose capacities are most likely to produce some advancement of knowledge. **This aim can be obtained by designing the rules of the functioning of the committee in such a way that the most likely Nash Equilibrium among the members of the committee does not reduce to the choice of the friend (or husband or mistress or faithful pupil) of one of the members of the committee but coincides with the choice of the candidate who has bigger merit**. One could thus obtain a Pareto improvement in the distribution of the resources (in this case the distribution of professorships) by means of mechanisms involving the (seemingly inevitable) fall towards Nash Equilibria inside selection committees. Pareto efficiency is a minimal notion of efficiency and does not necessarily result in a socially desirable distribution of resources: it makes no statement about equality, or the overall well-being of a society. In Pareto's definition there is no estimate of the relative weight of the different payoffs obtained by the different players: in other words to get a small favor (like being able to come home earlier after a committee gathering) in general is not comparable to the final attainment of a research project pursued for decades.[69] It is important to note that a change from an inefficient allocation to an efficient one does not need necessarily to be obtained by means of a Pareto improvement. Ensuring that nobody is disadvantaged by a change aimed at achieving Pareto efficiency may be impossible. For instance, if a change in economic policy eliminates a monopoly and that market subsequently becomes competitive and more efficient, the monopolist will be made worse off. Or getting rid of the absolute control of a department head may lead to a Pareto optimum, by means of a series of actions in which, of course, the department head will worse his payoffs. However, the loss inflicted to the monopolist (and to the department head) will be more than offset by the gain in efficiency. It could happen that, at the end of the process both the monopolist and the fired

[69]Moreover the interest of a single player could be very detrimental to many others: to get a chair in surgery could be highly rewarding for somebody, but it is not acceptable at the cost of the death of many patients, if the chair holder is not qualified enough. Remark that the notion of Pareto efficiency can be applied to the selection of alternatives in many kind of decision processes and t is adapted to get automated answers by means of well-specified algorithms. Each option is first assessed under multiple criteria determining the payoffs of the performed choices and then a subset of options is identified with the property that no other single's player option can categorically outperform the reached payoffs distribution (see e.g. [7]). Outcomes that are not Pareto efficient are to be avoided, and therefore Pareto efficiency is an important criterion for evaluating economic systems and public policies. Indeed if resources allocation in any system is not Pareto efficient, then a Pareto improvement can be obtained through reallocation: improvements can be obtained for at least one participant's well-being without reducing any other participant's well-being.

department head will be completely compensated by the enormous efficiency gain consequent to their fall. In real-world practice, such compensations have unintended consequences. They can lead to incentive distortions over time, as agents anticipate such compensations and change their actions accordingly. **A system can naturally, under some conditions, tend towards a Pareto optimum. The legislators should favor the conditions for the onset of such virtuous processes.**

3.3 Pier della Vigna search for Pareto Optima and the continuous fall towards Nash Equilibria in academic institutions

The system conceived by Pier della Vigna is also applied in the modern juridical system when the decision about the guiltiness of a citizen has to be taken. A group of citizens gathers in a justice court and carefully examines the evidence presented by the public accusation and the responses of the defense. The judgment of peers is the basis of modern judiciary system, but it has to be subjected to the control of a strict formal procedure and must avoid the emotions of a discussion involving too large judgement bodies.[70] **The experience of millennia of functioning of academic, juridical and electoral bodies shows that true democratic decisions are obtained in the case of criminal judgement (and also of comparative exams for tenured positions) by means of the same system: the works of a selecting committee of peers having neither a large number of members (to avoid that political dynamics could arise) nor a small number of members (for avoiding nepotism or dictatorship).**[71] However, it has to be considered that there is a strong and terrible force pushing every group of humans towards Nash Equilibria. These force is represented by the search of immediate self-satisfaction of each individual needs and interests.[72] Well: it is clear that the

[70]The democratic decision about the guiltiness of citizens in Athens has been abandoned by the modern systems: a large electoral body cannot avoid to be influenced by populism when dealing with such delicate questions. Instead group of persons not too big but not too small in number (say a group larger that 10 persons and smaller than 20) can dedicate the due attention to the case they are dealing with and after a sound and careful discussion they can arrive to vote their decision. Similarly, one should not believe that the democratic vote of a whole electoral body (the set of all citing authors of scientific papers) may be more effective of the work of 16 persons spending some weeks for deliberating about a tenured position.

[71]This system will be able to select relatively often the Pareto Optima for the academic institutions and therefore to perform the better choices for the society which invests on academic institutions for its-own development. Instead, populist votes are based on the consensus obtained from too large bodies, in which the single elector does not have the time to concentrate on a careful decision, which is ripened after a long process of discussion inside the decisional committee. These populist votes have nearly always a unique issue: the system falls towards a Nash Equilibrium, which is simply deadly for the advancement of human societies. Indeed, Nash equilibria do not allow for the maximum exploitation of the sometimes enormous potentialities and capabilities of human societies.

[72]Imagine that with a cooperative behavior Professor A could get an increase of the rank of his department (under the condition that all the other professors act similarly). In the virtuous situation he will get a higher amount of resources simply because more resources

strong push towards Nash Equilibrium tends to induce agents to assume that the other players will play in the worse possible way and as a consequence Pareto Optima will become unattainable. If, instead of a single decision maker, there will be a not so numerous committee then the outcome could be less negative.[73]

4 Some conclusions. [74]

The authors wants to reaffirm their persuasion that the technological advancement represented by online databases gathering all published books and papers, easily available from every terminal in every part of the world, undoubtedly represents a major conquer of human progress[75]. The Hellenistic dream of the Library of Alexandria repository of all human knowledge is becoming a reality.

However, as every new technological tools, its powers cannot be exaggerated and it cannot be misused. In particular, all available evidence seems to prove that the importance of bibliometric indicators obtained by means of online databases has been greatly exaggerated. The use of these indices do not represent a solution to the problem of evaluation of scientific papers, while on the contrary often they seem to make this evaluation more difficult.

The thesis presented in this paper is the following: **Bibliometric indices cannot be regarded from any point of view as a reliable and effective way for assessing the quality of a scientist or the importance of a scientific paper.** One can establish a parallel with the procedure which is used in criminal processes: there is no modern and advanced judiciary system in which the people are directly voting to sentence somebody as a consequence of a legal procedure. Instead, the most effective systems are appointing a jury

are assigned to his department. Therefore A has the following dilemma: if he hires a very weak PhD or PostDoc student (who is for instance the son of a friend) he will contribute to the collapse of the ranking of his department and he will not get many other resources. On the other hand if he hires a very strong student (but also if the other colleagues will do the same) he will get in the next resources distribution the budget for hiring a tenured assistant professor. This situation is very similar to the Prisoner Dilemma, with some ingredients of tit-for-tat mixed strategy. Professor A may decide to risk to make his friend (or his mistress) unhappy hoping to get next year more resources, or he may decide that it is better to get an immediate advantage and abandon any hope for future development of his department.

[73]The other members of the committee will not allow to Professor A to hire the son of his friend and Professor A will always be able to tell to his friend that it was not his fault if the stupid son could not get the required position. On the other hand to have the whole department to vote on the issue will not be at all positive: the friend of A could start making phone calls to all members of the department proposing exchanges and favors, and, as nobody had the time to assess how stupid is the son of the friend of A, this son could manage more easily to get his desired position. This example should have given a further clear argument in favor of Pier della Vigna solution.

[74]Following the advice of the authors' wise colleague already quoted in the introduction, the authors: i) refrained from explicitly criticize any of their colleagues, even if their academic life would have offered many flagrant occasions of complaint, ii) did not behave in a totally self-destructive way by engaging useless battles which do not take into account the present situation in the academic environment. Simply the authors tried to examine the proposed problem from a purely scientific point of view.

[75]Of course under the condition that these databases be available easily and nearly free of charge at least to all scientists.

constituted by some citizens and by some professional judges. The duty of this jury, after a long and careful debate which must follow a well-determined rite, is to produce a final sentence. Similarly Pier della Vigna established that **a jury of peers must be appointed of the duty to assure, once and forever, to somebody those privileges which are needed to exert the role of university professor. This jury, by following a carefully well-determined rite, will elect a new peer who will share with his colleagues the duty of working for the advancement of science.**

Once artificial intelligence will be available, and only if the behavior of involved robots will be controlled by the equivalent of the Asimov's three laws, these juries could be replaced by a system of evaluation independent of human decisions.[76]

Another conclusion is needed at this point: again, **more modern does not mean necessarily better** ([15]). The modern system of counting citations, which became possible because of the invention of the web and the development of modern search softwares, is not at all better than the old system conceived during the XI, XII and XIII centuries for selecting University Professors.[77] **One has indeed to recognize that the folly of counting citations and the related habit of basing on this count the career of scientists has to be firmly contrasted**.[78]

References

[1] AA.VV. Enciclopedia Federiciana Ist. Naz. Encicl. Treccani: Studio di Napoli.

[2] Boden M. Creativity and Artificial Intelligence Artificial Intelligence 103 (1998) pp. 347-356

[3] Browne, C., Colton, S. Computational creativity in a closed game system (2012) IEEE Conference CIG 2012 pp. 296-303.

[76] A colleague wanted to underline that to this aim it is needed more than a software: instead it is required a truly intelligent and independent system capable of abstract thought. Indeed a software conceived by humans even with a sophisticated structure would, at the end, have the same drawbacks as the use of bibliometric indices. On the other hand an intelligent system, endowed with a high ethical standards and capable to understand the most advanced scientific creations of human mind, would be perfectly adapted to replace a peers' evaluation: maybe as a further guarantee one could use a committee of robots!

[77] It is indeed true that the modern Library of Alexandria is nowadays easily available to everybody (under the condition that he pays, and sometimes the price is too expensive) thanks to the web. It is also true that this circumstance will greatly increase the advancement of research and science: however, the misuse of the scientific data bases can produce very detrimental effects.

[78] Those who in good faith do believe that the academic system could survive to the bibliometrics and bibliometric indices should carefully study the book by Trivers [18]. The logic of deceit and self-deception in human life is being studied more and more carefully by means of the scientific method: nobody can believe seriously that the number of friends who cited a given paper can be used as a measure of its scientific quality. To use bibliometric indices is equivalent to allow for deceit and self-deception in academic life.

[4] De Waal, FBM. Chimpanzee politics: Power and sex among apes. JHU Press, 2007.

[5] De Waal, FBM Primates and Philosophers: How Morality Evolved, Princeton Univ. Press (2009)

[6] De Waal, FBM. Primates–a natural heritage of conflict resolution. Science 289.5479 (2000): 586-590.

[7] Fudenberg, D. and Tirole J. (1991) Game Theory MIT Press.

[8] Harcourt, A. H., and FBM De Waal. Coalitions and alliances in humans and other animals. Oxford Univ. Press, 1992.

[9] Hardin G. The Tragedy of the Commons Science 162 (3859): 1243–1248. 1968.

[10] Gingras Y. Les dérives de l'évaluation de la recherche Du bon usage de la bibliometrie Raisons d'Agir Paris (2014)

[11] Gunn, J. Isaac Asimov: the foundations of science fiction. Scarecrow Press 1996.

[12] D.R. Hofstadter Fluid Concepts and Creative Analogies: Computer Models of the Fundamental Mechanisms of Thought, Basic Books (1995).

[13] P. Langley, H.A. Simon, G.L. Bradshaw, J.M. Zytkow, Scientific Discovery: Computational Explorations of the Creative Process, MIT Press, 1987.

[14] Leyton-Brown, K.; Shoham, Y. (2008), Essentials of Game Theory: A Concise, Multidisciplinary Introduction Morgan & Claypool

[15] Lucio Russo The Forgotten Revolution How Science Was Born in 300 BC and Why It Had to Be Reborn, Berlin, Springer, 2004

[16] S. Schaffer, Making up discovery, in: M.A. Boden (Ed.), Dimensions of Creativity, MIT Press, Cambridge, MA, 1994, pp. 13-51.

[17] Sokal, Alan D., and Jean Bricmont. Intellectual impostures: postmodern philosophers' abuse of science. Profile Books, 1998.

[18] Trivers, Robert. The folly of fools: The logic of deceit and self-deception in human life. Basic Books, 2011.

[19] Truesdell C. Essays in the History of Mechanics Springer Verlag (1968)

[20] Jacques Verger, Les universités au Moyen Age , Presses Universitaires de France, Paris 1973