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NPTEL

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Science, Technology and Society

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Having discouraged the first part of the Matthew effecting sciences when we discussed the reward and the communication system proposed by mutter.

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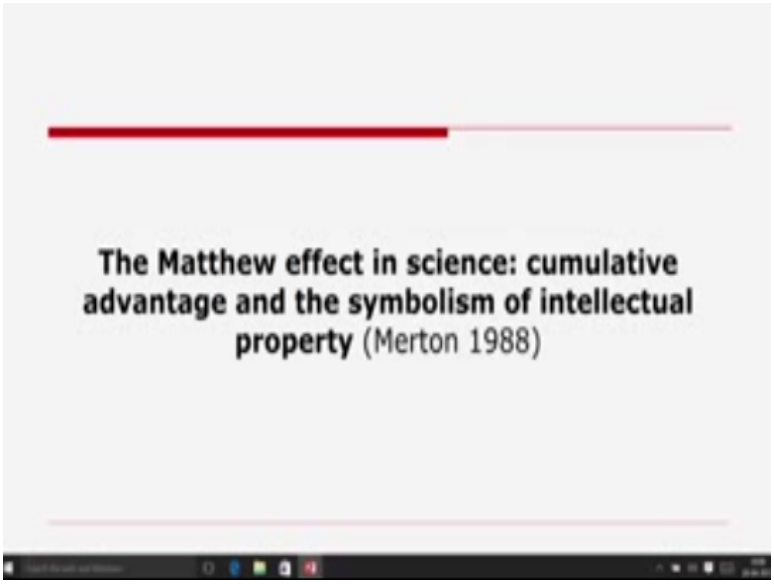

Now we will discuss the second part of the Matthew effect in science in the form of cumulative advantage and symbolism of intellectual property okay now when we discuss these two aspect against the backdrop of natural fact in science namely cumulative advantage and the symbolism of intellectual property means cumulative advantage on the one hand and intellectual property on the other then what do these two terms reflect okay cumulative advantage in science refers to the social processes through which various kinds of opportunities for scientific inquiries.

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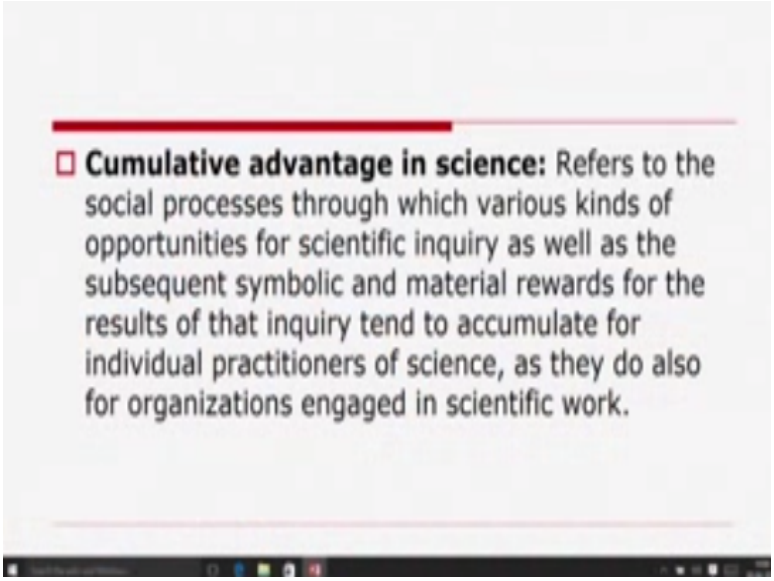

As well as the subsequent symbolic and material viewers for the results of that inquiry tend to accumulate for individual practitioners of science as they do also for organizations engaged in scientific work in here Morton try to look at individual practitioners of science okay then he will move on to scientific community as such then he will move on to the accumulation of scientific knowledge by the young professional I mean junior scientist students okay.

And then you will wait on getting to accumulation of scientific knowledge by research organization research institutions okay in this sense we are trying to look at cumulative advantage in science which refers it is applied in the domain of science itself which refers to the social processes through which various kinds of opportunities for scientific inquiry as well as the subsequent symbolic and material reward for the results of that inquiry came to accumulate for individual practitioners of science I mean scientists themselves as they do also for organizations engaged in scientific work.

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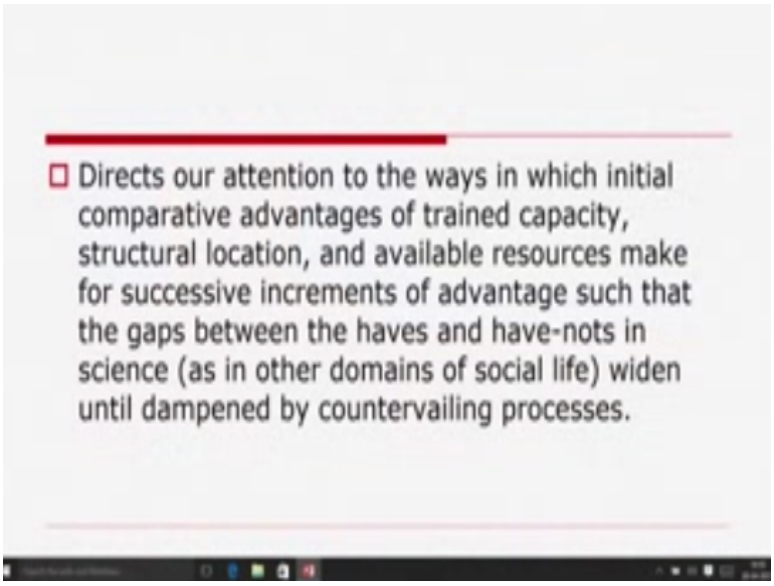

Such cumulative advantage enzyme directs our attention to the way in which is your comparative advantages of trained capacity structural location and available resources make for successive increments of advantage such that the gaps between the hands on the one hand and the have-nots from the other enzymes as is envisaged in other domains of social life which widens until death a dampened by countervailing forces which water countervailing forces we will forces discuss a little while later okay.

But the way cumulative advantage in science is discussed here by Merton okay it directs our attention to the way in which initial competitive advantages of one trained capacity to structural location three available resources which make for successive increments of advantage such that the gaps between the haves and the have-nots in science as we find the similar trains in other domains of social life which get widened until it dampened by countervailing processes here is the first part that you will find that cumulative advantage science.

Then what is this intellectual property in science Merton propose the seeming paradox that in science private property is established by having its substance free given to others who might want to making of it you know what we have already discussed the ethos of science by Merton where we discussed ethos of modern science namely universalism, community disinterestedness and organized captivity okay communism is very integral to the debates on intellectual property in science what did we discuss in community.

That the product or the process must be owned by the scientific community must be owned by no I mean it must be owned by the scientific community in such a way that it will have a greater accessibility for the public okay now due to intellectual property in science the concept of private property is imposed on the fruits of such technological development born out of science okay now Merton proposed that proposed the seeming paradox that in science private property the notion of intellectual property the notion of private property in a more capitalistic fence.

Is established by having its substance freely given to others who might want to making of it okay in such a scenario what we generally find that certain institutionalized aspects of this property system chiefly in the form of public acknowledgement of the source of knowledge.

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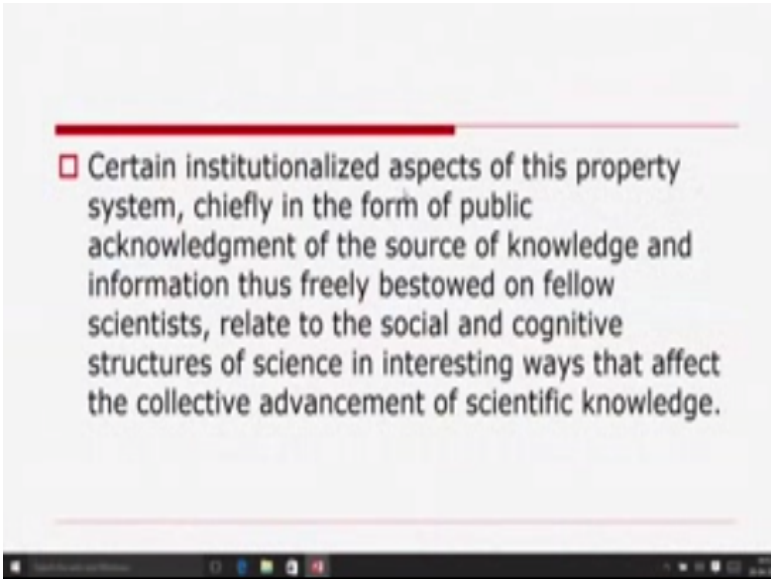

And information thus freely bestowed on fellow scientists relate to the social one and second cognitive structures of science in interesting ways that effect the collective advancement of scientific knowledge when I say when we say social structure of science and when we say cognitive structure of science they should not be examined in isolation and any attempt to study them in isolation I will be misleading okay social and cognitive they are interrelated okay cognition means ways to know okay.

Now the cognitive structure of science must be socially politically economically culturally institutionally ideologically, legally, ethically embedded okay now if in intellectual property in science such is teachers analyzed aspects of such property system in a more capitalistic sense

chiefly in the form of public acknowledgement of the source of knowledge and information okay which is freely bestowed and fellow scientists relate to these two structures of science namely social on the one hand and cognitive on the other in interesting ways. That affects the collective advancement of scientific knowledge okay.

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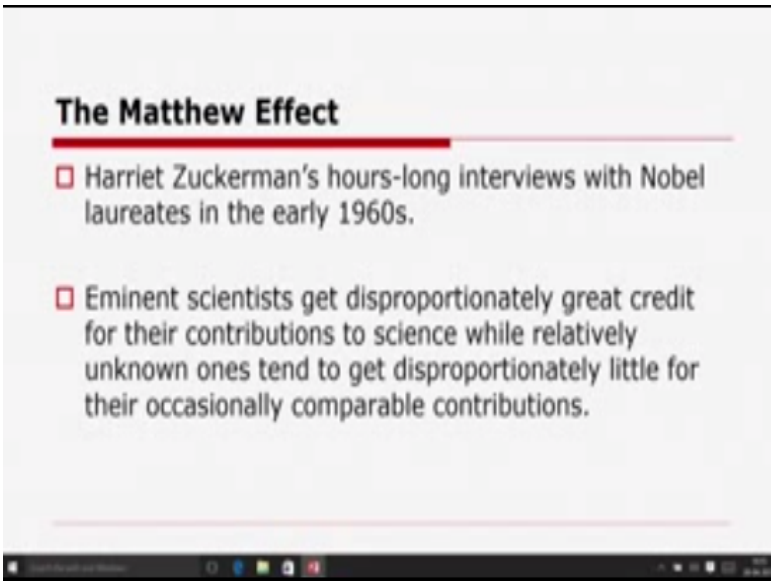

Now in this in this lecture what we are going to do we are going to look at the Matthew effect in it is generality okay, I mean the Matthew effect in science in it is generality okay the accumulation of advantage and disadvantage for scientists accumulation of advantage and disadvantage among the young scientists in particular then accumulation of advantage and disadvantage among scientific institutions research organizations research institutions then followed by the countervailing forces and the symbolism of intellectual property in science okay.

Now let us see how the Matthew effect in science in it is generality may be discussed okay let us begin by noting theme okay let us begin by noting the theme that runs through Harriet Zuckerman's hour-long interviews with Nobel laureates in the early 1960s as we have already discussed Harriet Zuckerman's was a collaborator of Robert Martin. Martin bank Zuckerman's interview with Nobel laureate to locate you to project inequality science okay.

And it is repeatedly suggested in those interviews conducted by Harriet Zuckerman's okay that eminent scientists get disproportionately credit great credit for their contributions to science

while relatively unknown one unknown scientist relatively less known scientists tend to get disproportionately little for their occasionally comparable contributions okay.

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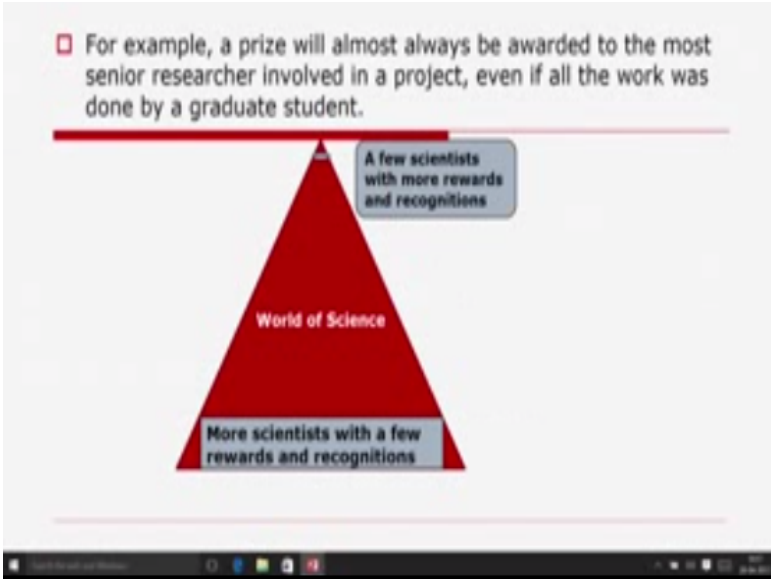

Let us let us put it this way if I if I can do this that term that that for example a prize will almost always be awarded to the most senior researcher involved in project even if all the work has been was done by a graduate student or a junior scientist okay, if we if you look at the slide here that the world of science is just like a pyramid structure or a triangle where at the lower level you will find more and more scientists with a very few reward and recognitions the world of science has been structured in such a way that at the top there will be of very few scientists with more rewards and recognition even if those even if all the work has been done by lesser-known scientist or graduate students.

Okay such unequal structure that you see on the slide that the world of science has created I mean there the world of science has been structured in such a way that it has posts it has created such inequalities okay in this context it is important to note from Zuckerman's interviews which Nobel laureate that how a eminent scientists they disproportionately great credit for their contributions to science while relatively unknown scientists relatively lesser known practitioners of science tend to get disproportionately little for their occasionally comparable contributions.

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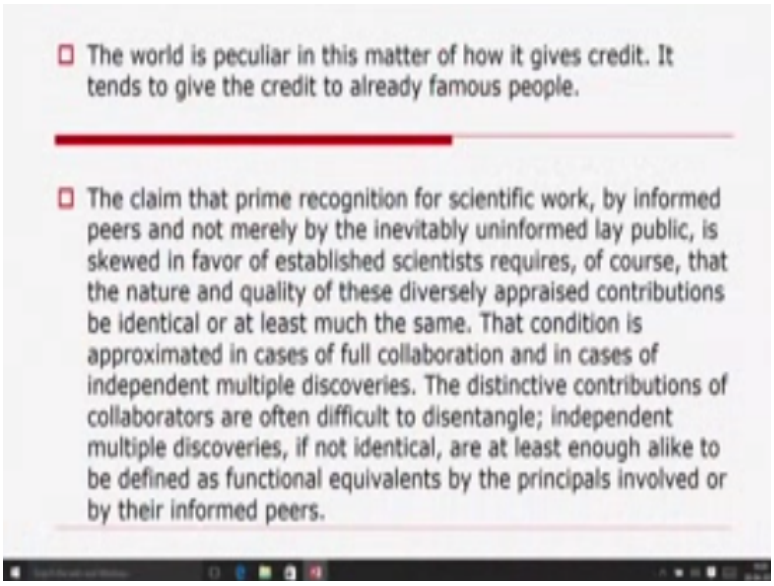

Okay this is very important but letting the argument strengthening the argument further one novel Nobel laureates told her Harriet Zuckerman's wants in the process of such interviews that the world is peculiar in these matters of how it gives credit it is a petulant but the world is peculiar including the world of science is peculiar in this matter of how it gives credit it tends to give the credit to already generally to already known people okay.

This is very important the claim that prime recognition for scientific walk by informed peers and not merely by the inevitably uninformed lay public is killed in favor of established scientists requires indeed that the nature and quality of these diversely apprized contributions be identical or at least much the same that condition such condition is approximated in cases of full collaboration and in cases of independent multiple discouraged that is why Martin was given the example of Newton in live is earlier we have already discussed okay.

If you look at history of science in I mean history of physics, history of mathematics okay you will find the kind of controversies which arose in the context of the works off Newton as well as livelihood okay such condition is approximated in cases of full collaboration and in cases of independent multiple disturbance at least now independent multiple discovering have been attributed to the controversies of controversies between a Newton and like this okay.

It is very important such inequality persist in the world of science itself as we have discussed in this slide okay the distinctive contributions of collaborators are often difficult to disentangle to disentangle independent multiple discoveries is not identical or at least enough alike to be

defined as functional equivalence by the principles involved I mean principal investigators involved or by their informed peer groups such it is it is designed in such a manner that the whole lot of relatively lesser known scientists practitioners of science will be left out of the of the of the way the world of sign have been structured okay. It is it is important to know too it is important to understand such niche allocation of recognition.

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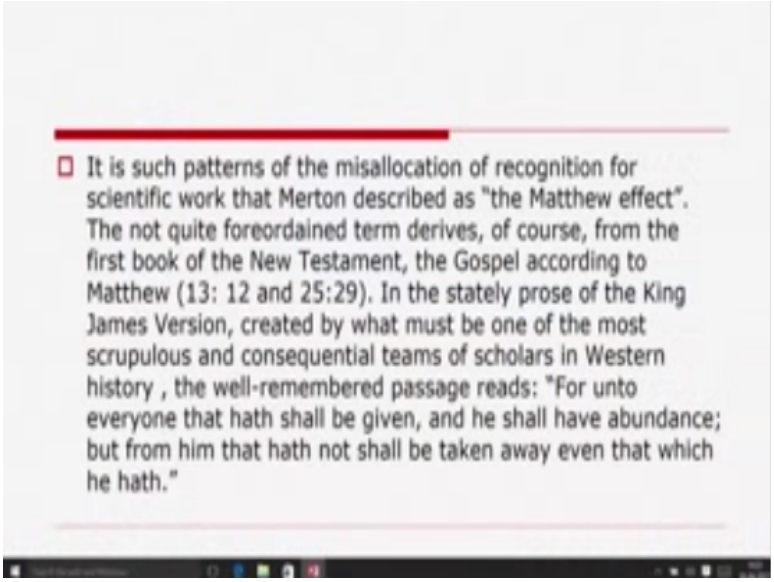

That how a very few scientists get alludes even if much of the work has been carried out by the junior scientist or graduate students PhD students okay a Nobel laureate in physics told her Zuckerman's that the man who is best known gets more credit and inordinate amount of credit a Nobel laureate in chemistry puts it this way that let me quote here if my name is if my name was on a paper people would remember it not remember who else was involved the biological scientists like RC Lyon chuang and JL hobby has lately imported a similar pattern of experience with a pair of their collaborative papers okay.

I mean in terms of sites encloses okay I mean even if other even is less significant less prominent authors have contributed to the designing of a paper this through the making of that paper the

more well-known scientists get the all the ecology the way Lyon chuang and hobby described the matter of the Matthew effect I mean not the way Merton try to do that try to theorize about it okay they also try to reflect on this aspect of inequalities in science in terms of their own Leben world I mean it is I mean like world okay.

It is a French German word okay let in Latin also people use labes world it means life world those Nobel language namely leontyne and hobby they were trying to say that one paper was cited some 310 times the other some 300, 525 times the first paper described the method and the second let me quote here it is very interesting if the first paper described the method the second paper gave the detailed result of the application of the method to natural population the two papers were genuinely collaborative effort in conception execution and writing and clearly formed an invisible pair.

Published back-to-back in the same issue of the journal the order of authors was alternated with the biochemist hobby being the senior author in the method papers and the population geneticist Lyon chuang and as senior author in the application okay yet paper too has been cited over 50% more than more frequently than paper one I mean the application paper has been cited more frequently than the methodological paper okay then citations to paper one as both knowledge both Nobel laureate namely Lyon chuang and and hobby.

They put it the citations to the method methodological papers virtually never stand alone but nearly always paired with the citation to the application the paper which application but the reverse is not true wherever the paper which application has been cited it is not necessary that the metrological paper also has been cited why I mean what is the reason we seem to have a clear-cut case of Marten Matthew effect that is what they were trying to see both Nobel laureate.

They were trying to look at morotonian inequalities in science morotonian Matthew effect in science in terms of rewards in terms of recognitions in terms of cumulative advantage in science and in terms of symbolism of intellectual property in science okay that they already better known investigator in a field get the credit for joint work irrespective of the order of authors on the paper and so gets even better known by an by an auto collector autocatalytic process in 1966 Lyon chuang had been a professional for a dozen years.

And was well known among the population geneticist to whom the paper was addressed while hobbies carriers had been much shorter and was known chiefly to biochemical geneticist as a result the population geneticist have consistently regarded Lyon chuang as the senior member of the team and given him undue credit for what was a completely collaborative work that would have been impossible for either one of us alone that is what it is such as both of at the extreme at the extreme if you look at me okay at the extreme such miss allocation of credit can occur you will win a published paper there is only the name of a heberto unknown and uncredentialed scientist.

Consider let us consider this observation by the invincible geneticist and biochemist we all know him I mean HTS scholars also know him as your top class historian of science JBS Haldane who is not having received a Nobel Prize can be sited as prime evidence of the fallibility of the judges in the in the Swedish Academy of science I mean Stockholm they decide nobody recent we all know what kind of problems it can approach speaking with Renault clock of Sk roy is I mean is talented Indian student from India who had conducted important experiments designated to improves trains of rice Haldane observed it.

JBS Haldane I said he was done with a great now a geneticist and biochemist eminent historian of science as well okay he observed Haldane observed that roy himself deserved and in that student from India he himself deserved 95% of the credit the other 5% maybe divided between the Indian Statistical Institute in Kolkata and myself Haldane himself he added Haldane deserves credit for letting him try what he thought was a rather implant experiment on the general principle that that Harlan himself is not completed.

But Haldane had little hope that credit would be given that way every effort will be made here to cram his work he wrote he has got has not got a PhD now or even a first class of MHC I mean right okay so either the research is good or I did it I am Haldane mentioned okay, now if you look at these such myth a location of reward missile location or are cognition that we have we have seen in this in this slide in the world of science I mean where more scientists are endowed with of very few rewards and recognition and a very few scientists with more reversal recognition.

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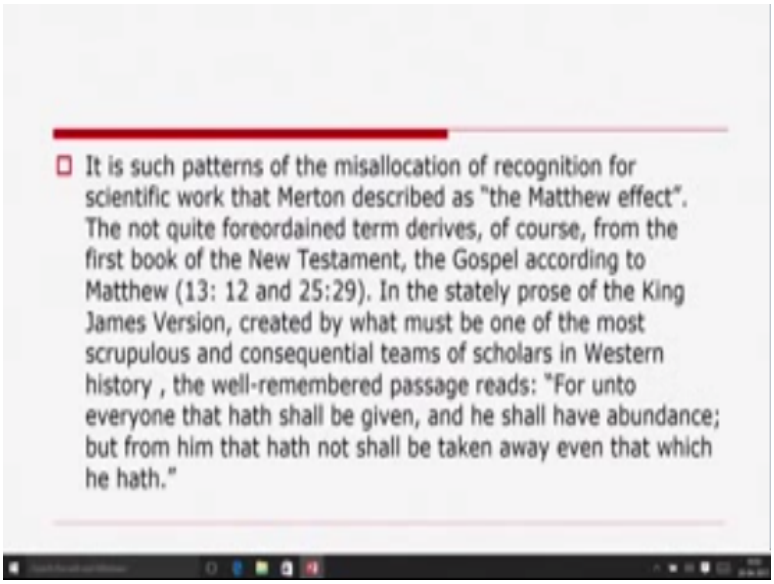

What we find it that it is such patterns of miss allocation of recognition for scientific works that Matron described as a Matthew not quite 4 audience term derives of course from the first book of the New Testament the Gospel according to Matthew in the stately propose of the King James Version created by what must be one of the most scrupulous and in consequential teams of scholars in Western history the well-remembered passage read for offer unto everyone that have shall be given he shall have abundance but from him that hath not shall be taken away even that which he had I mean this is a clear case of a clear case of the distinction between the hath and the have-nots okay.

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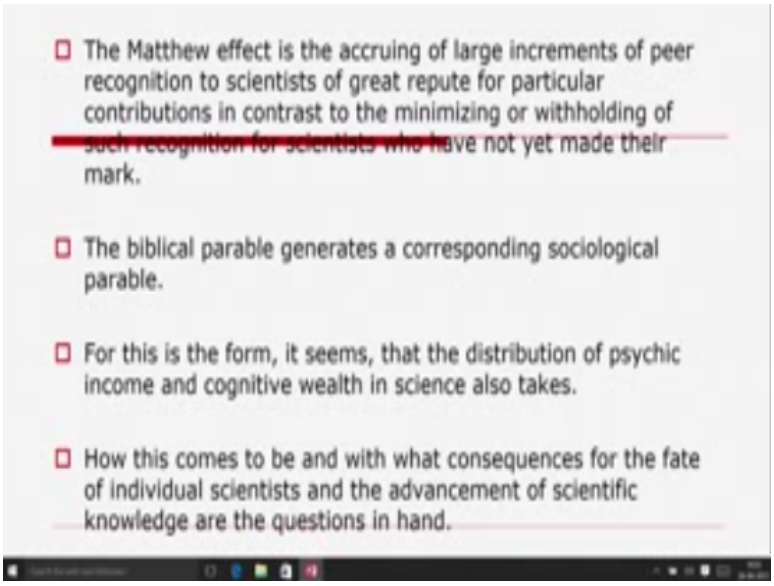

Now from such I mean we must go beyond we must make a shift from such spiritual account of inequality to a more secular account of inequality okay that is what to Marten also sense that let us move on to but we let take this account okay let us take the let us use this term to make sense of the of the data which have been derived from Zuckerman's intertidal now the Matthew effect in is occurring of large increments of pear recognition of two scientists of great tube for particular contributions in contrast to the minimizing or withholding of such recognition for scientists.

Who have not yet made their mark the biblical parable generates the corresponding sociological parable that is why we must make this shift from a biblical account to a more sociological account or of two or more circular okay this is form it seems that the distribution of psychic income and cognitive wealth in sciences also takes how this comes to be and with what consequences for the fake of individual practitioners of science and the advancement of scientific knowledge are the questions in hand okay.

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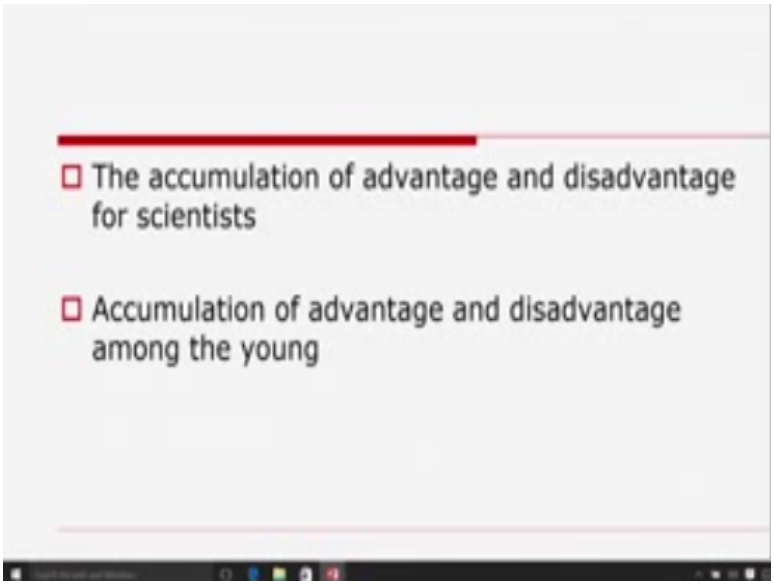

Now it is very important to understand such them okay now what we have discussed till done in this 20 25 minutes that what we have discussed we have discussed the Matthew effects in the context of cumulative advantage in science as well as the symbolism of intellectual property but we have not yet come to in detail at length and in detail cumulative advantage and intellectual property in science we will come to this point okay partly we have covered cumulative advantage but we will come to cumulative advantage in much detail now.

Okay what we have discussed and in cumulative advantage in science which refers to the social processes through which various kinds of opportunities for scientific inquiry as well as the sub sequent symbolic and material viewers for the result of that inquiry tend to accumulate for individual scientist as they do also for organizations engaged in scientific core that is why individual is always a part of that institution okay.

Further cumulative advantage in science direct our attention to the ways in which initial comparative advantages of trained capacity structural location and available resources make for successful successive increment of advantage such that the gaps between the haves and the have-nots in science the gapes more well-known scientists within which a very few I mean more well-known of a very few well non-scientists with more rewards and recognition.

On the one hand and more scientists with no references the gaps between the haves and the have-nots still times widen until dampened by countervailing processes what are the countervailing processes we discussed okay.

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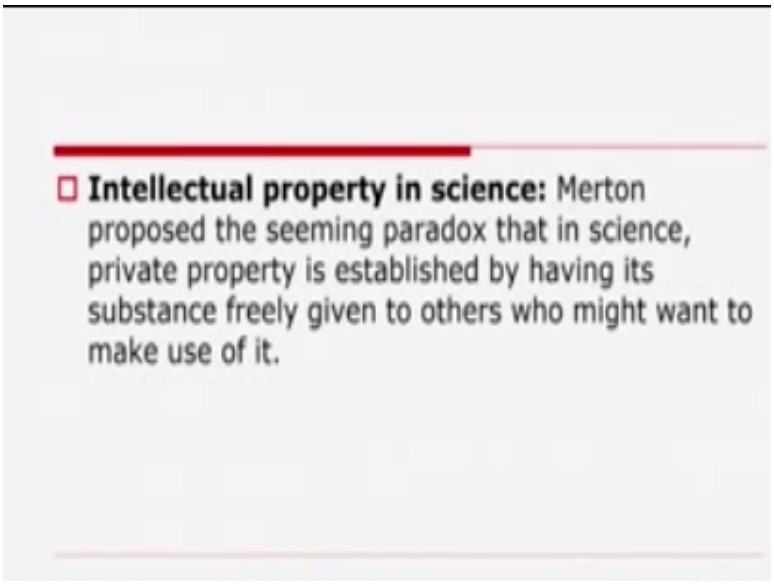

Further intellectual property in science as Merton proposed that the seeming paradox that inclines private property is established by having this substance freely given to others who might want to make use of it and certain institutionalized aspects of this property system chiefly in the form of public acknowledgement of the source of knowledge and information the freely bestowed on fellow scientists relates to the social and cognitive structures of science in interesting ways that effect the collective advancement of scientific knowledge thus the social and the cognitive structures of science should not be treated in isolation.

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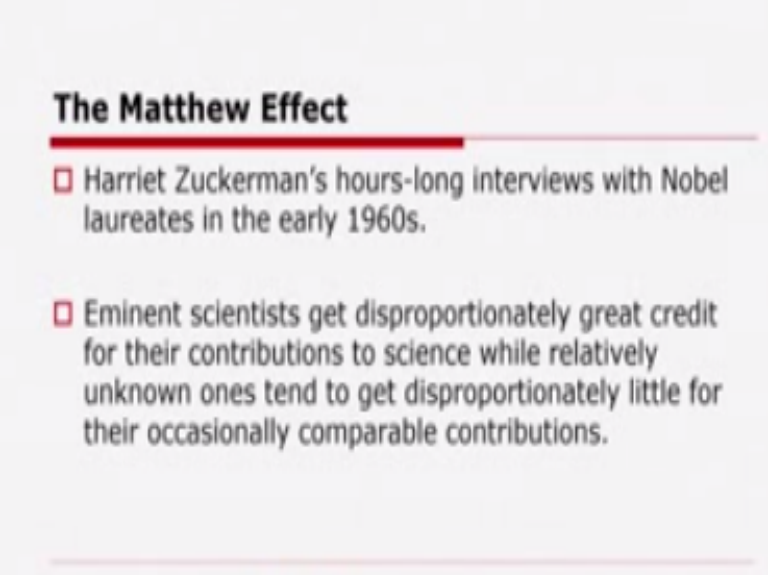

Then we discuss the material facts later given the metal affecting science in its generality okay, how eminent scientists get disproportionately great credit for their contributions to science while relatively unknown scientists tend to get disproportionately little or nothing for they are occasionally comparable contributions.

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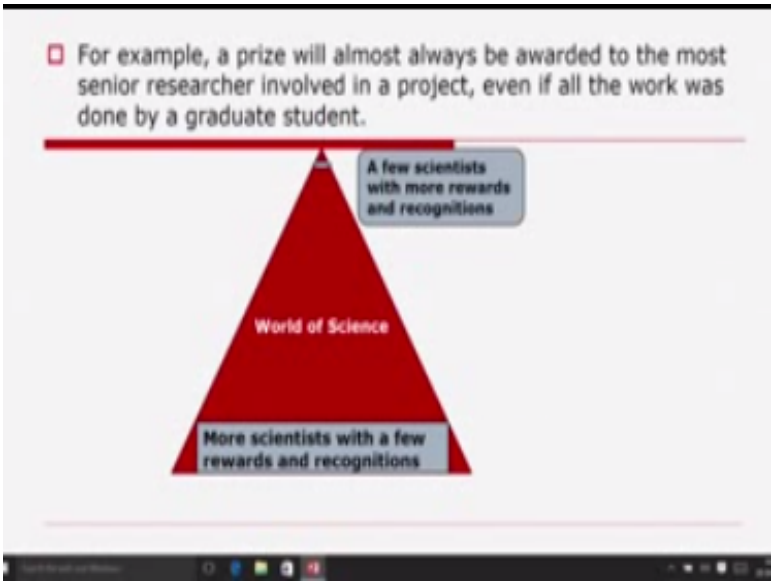

This is how for example we discussed a prize will almost always be rewarded to the most senior researcher involved in a project even if all the work was done by a graduate student or a junior scientist, that is this is how we try to look at the world of science this is how we look at the ways in which the world of sciences in structure and where you will find the world of science is structured in such a way that that it poses I mean it has it has an internal structure that which is externally conditioned that that where you will find more scientists with a few rewards and recognitions.

And a very few scientists with more rewards and recognitions conditions at the top level that is why we have put it this way that more scientists a few reward and recognition at the bottom levels at the bottom you will find many scientist with little recognition but at the top you will find a very few scientists which more rewards and recognitions okay that is why in the words of a laureate Nobel laureate as Jacqueline posted lecture the world is peculiar in this matter of how it means credit it tends to give the credit to already famous people – already well-known people okay.

Then we discussed how the claim that prime recognition for scientific work by infirmed peers and not merely by the inevitably uninformed lay public is cued in favor of established scientists requires.

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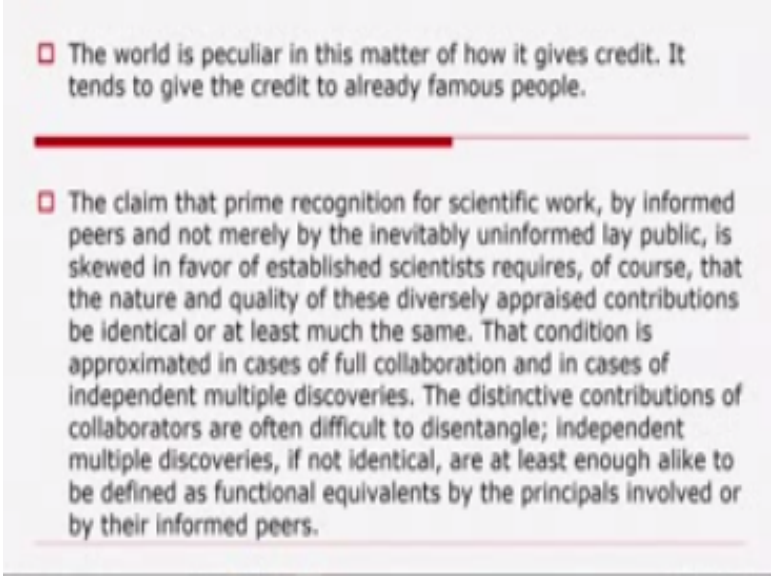

Of course that the nature and quality of being diverse alia prized contributions be identical or at least much the same and such condition is approximated in the cases of full collaboration or in the cases of independent multiple discoveries that we have already discussed in the context of the controversies between Newton and Leibniz and such distinctive contributions to collaborator of collaborators are often difficult to disentangle independent multiple discoveries is not identical or at least enough alike to be defined as functional equivalence by the principal investigators involved or by their informed peer codes.

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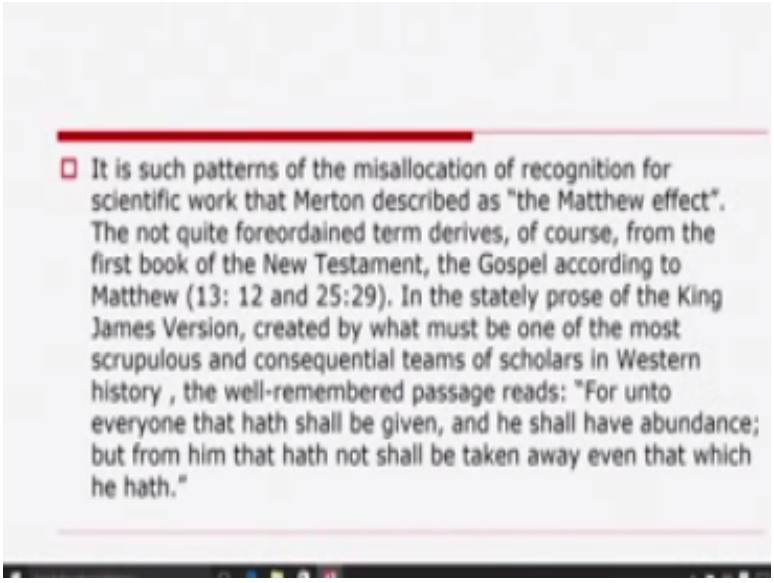

And it is such patterns of the misallocation of recognition where your work remains or your work goes unrecognized for the scientific work that Martin described as a natural effect the not quite poor or dense term derives of course from the first book of the New Testament the Gospel according to Matthew this is a spiritual account I mean this is not what we are doing here it is we are trying to make a shift from we are taking the exotic taking the turn from such biblical account.

But we are trying to make a step from such spiritual account of inequality of enzymes to a more secular account of any connotation science in the stately prose of the King James Version created by what must be one of the most scrupulous and consequently regimes of scholars in Western history the well-remembered that is read for unto every one that has shall be given and he shall have abundance.

But from him that has not shall be taken away even that which he hath I mean for unto every one that has shall be given and he shall have abundance but from him that has not shall be taken away even if that which he hath I mean hath in distance I mean in English it will hatch okay I mean this is also English but the earlier usage of English was hatched I mean in the biblical account okay.

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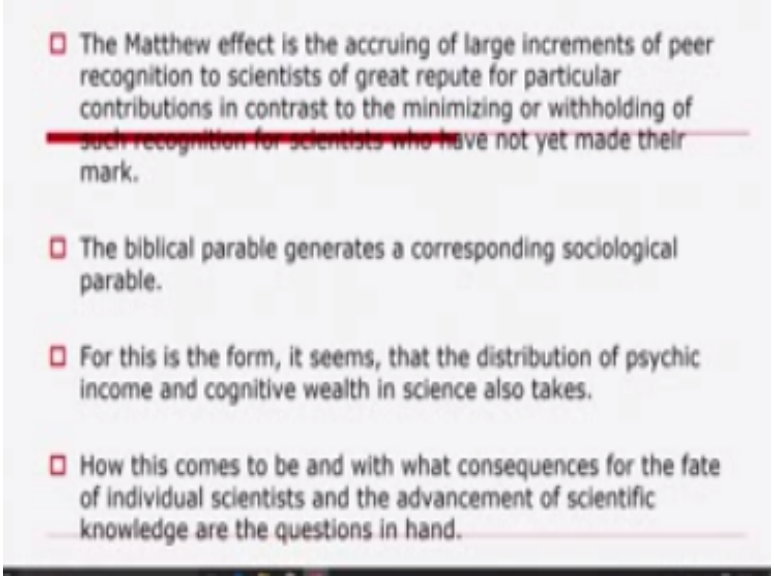

And the Matthew effect is the echoing of large increments of here dated listen to scientists of great repute for particular contribution in contrast to the minimizing or withholding of such recognition for scientists who have not yet made their mark the Bible occult parable generates the corresponding sociological parable that is what I said I mean we must make a shift from such biblical or spiritual account to a more sociological account to a more scientific account to or to a more secular account okay to posit such inequalities in science for this is the form it seems that the distribution of cyclic income and cognitive wealth of science also takes place.

How this comes to be and with what consequences for the fate of individual scientists and the advancement of scientific knowledge or the questions in hand.

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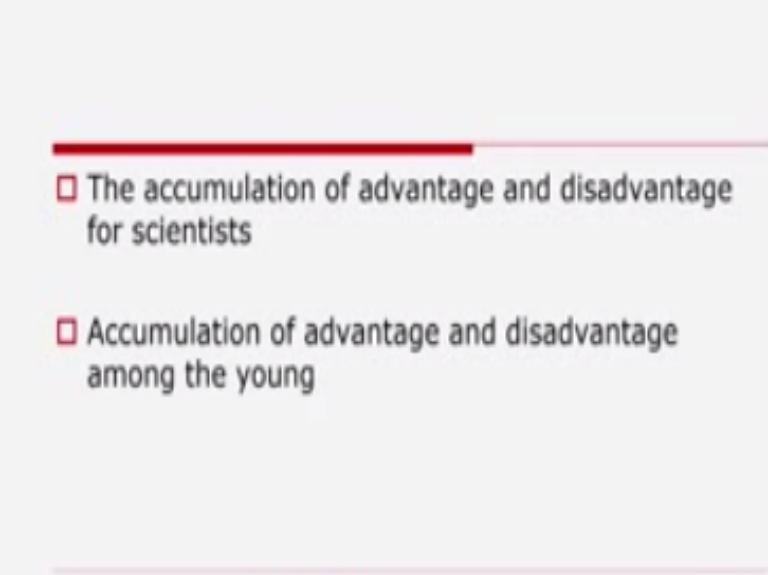

From here onwards we will move on to the accumulation of advantage and disadvantage for scientists then we will move on to the accumulation of advantage and disadvantages among the young scientists junior scientists graduate students is de students then will move on to accumulation or advantage and disadvantage among scientific institutions research organization research systems instance all followed by countervailing processes and the symbolism of intellectual property in science okay.

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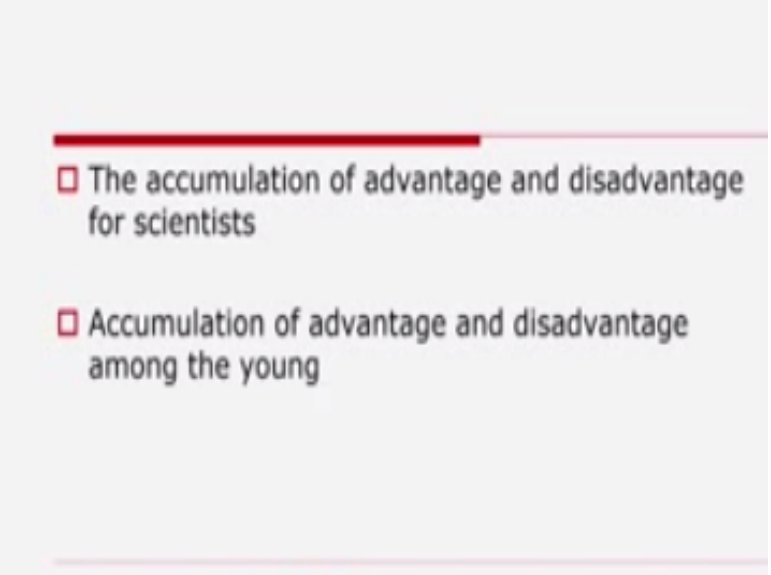

Now let us start with the accumulation of advantage and disadvantage for scientist take taken out of its spiritual context ok and place your holy secular context the Mathew doctrine the material effect would seem to hold that the posited process must result in a boundlessly growing inequality of wealth. However wealth is construed in any sphere of human activity concept of just locally ongoing process and not as a single event the practice of giving on to everyone that has much while taking from everyone that has little will lead to the rich getting forever richer while the poor become poorer.

Increasingly absolute and not only relative deprivation would bigger continuing order of the day but as we know things are not as simple as all that after all the extrapolation of local exponential is notoriously misleading in noting this motion did not intend to assess the current economic theory of the distribution of wealth and income instead he reported instead Merton reported what a focus upon now the few distribution of pure recognition and research productivity in science has led some of us to identify as the processes and consequences of the accumulation of advantage and disadvantage in science okay.

I mean for the I mean when Merton tried to look at such research I mean when Merton first stumbled upon the general question of social stratification in science in the early 1940s one paper of that period alludes to the accumulation of differential advantages for certain segments of the population differentials that are not necessarily bound up with demonstrated differences in capacity it would not be correct or indeed just to say that the text is no clearer to anybody now

than the notoriously obscure anything was clear to somebody else okay that is why now for such for such things the notion of cumulative advantage in science had led only to a ghostly existence in private music sporadically conjured up first oral publication rather than putting paint.

Further investigation of the process of cumulative advantage took hold in the later 1960s with the formation of a research quartet of at Columbia consisting of Harriet Juker man stiff and cold Jonathan R Pole and Robert King Martin okay I mean if you look at the galaxy of thinkers okay you will find their work not only in humanities and social sciences but also in Sciences engineering okay they had enormous impact their writings had enormous impact on the world of Sciences as well as the world of humanities and social sciences.

That is since emerged an invisible College as Merton put it in fact the invisible college I mean and that was coined by Derek BJ's solar price okay what is that what does that refer to okay that means to adapt the brilliant I mean terminological return age by solar price which has grown apace in contributing to a program of research on cumulative advantage and disadvantage in social stratification generally and in time specifically okay see one must remember the difference between stratification hierarchy and so on.

But this is not a course in introduction to sociology which I had earlier offer being under NPTEL okay but still one must remember the vertical and horizontal aspects of both stratification knowledge hierarchy if you want you can look at the lecture notes of NPTEL in lecture notes of introduction to sociology which I developed under NPTEL page two okay notably including Derrick DJ solar prides himself until I mean till his the sad demise that college also numbers when Allison barber law and others there are so many okay.

This theory when we discuss solar prices in visible college in the context of such social stratification in science okay differentiation enzymes differential treatment in the world of science to its own practitioners okay there is not be occasion for providing a synopsis or of that now concern now considerable body of wreckage material rather what Merton D Merton only reminded us of a few of the Mart inequality and strongly skewed distributions of productivity and resources in science and then focus on the consequences of the bias focused on the consequences of such bias perfidious in favor of pica city that is built into our institutions are detecting and rewarding talent and institutionalized bias that may help bring about severe inequalities during the life's course of scholars including scientist.

Then let us first have a quick sampling of the abundance of conspicuously skilled distributions and inequalities identifiable at a given gas okay, then modern tried to provide certain examples to look at how such sampling of the abundance of conspicuously cube distributions and inequalities okay within the total number of scientific papers published by scientists differs enormously ranging from the large proportion of PhD who published one paper or none at all to the rare likes of many scholars who have produced many papers from the PhD thesis okay.

Like William Thompson Kelvin with his 600 plus papers or the mathematician Kelly publishing a paper every three weeks throughout his work life for a total of almost a thousand okay. Secondly the steam distribution of the sheer number of published papers is best approximated by variants of Luggage Alfert J Lotcos inverse square law scientific productivity which states that the number of scientists with n publications in stock is proportional to n square okay.

Now in a variety of disciplines this works out to some five to six percent of the scientists who publish at all at all producing about half of all papers in their disciplines but even when I talk to my PhD student I always very often tell them not always but I are very often tell them that you publish or perish okay but when you look at publications when you look at publications over a period of time okay, now I always feel that instead of publishing perishable items one must refrain from publishing is very important well we will discuss these things mainly these items or these nurses always pour out I mean the nose is always propellers to think beyond the world of publication okay.

It does not imply that one should not publish one must publish but instead of publishing variable items okay one must refrain from publishing one must publish something which is novel one must publish something which has not been touched upon by others one must build on those existing material to come up with something new that new next maybe very who may be at a very rudimentary stage may be at a very elementary stage but one must be able to publish new things okay.

That is how we tend to look at the tradition of cumulative knowledge products the distributions the distributions in publications are even more skilled in the use of scientists warned by their peer groups as that use is crudely indexed by the number of citations to it much the same

distribution has been found in various datasets typically Goff in finding that for an aggregate of some 19 million articles published in the physical and biological sciences between 1961.

And 1980, 0.3% we recited more than 100 times another 2.7% between 25 and hundred times and at the other extreme some 58% of those papers articles that were cited at all were cited only once in that 20 year period this inequality which is recognized is steeper than Perico light distributions of income Wilfred primary so if somebody is very interested to look at that so if one can look at of Wilfred do pathos economic theory of distribution, distribution of income okay.

When it comes to but this is not a part of our exercise but I am just trying to give you such an example so somebody can go very interdisciplinary as HTS itself is interdisciplinary that is why I said from the very beginning I said HTS is such an interdisciplinary exciting enterprise that you will find that it is a conglomeration of philosophy of science history of science and sociology of science.

Now many aspects many fields of inquiry they also contribute to the to the development of HTS for example literature okay it is very important linguistics very important okay we must anthropology psychology okay are very important when it comes to changes in the extent of inequalities of research productivity and recognition during the course of an individual's work life as a scientist they needed longitudinal data are much more scored again a few suggestive findings which Merton ma has provided unlike me I mean in that simulation of longitudinal data through desegregation offer cross section of some 2,000 American biologists mathematicians chemists and physicists into several strata of my career age Paul D Allison and Johnny Stewart found that a clear and substantial rising inequality for both the number of research publications in the preceding five years.

And the number of citations to previously researched work from the younger to be older strata strongly supporting the accumulative advantage Alison and Stewart secondly also confirmed the Jackert and Merton hypothesis that decreasing research productivity within creasing razor's edge results largely from differing rates of attrition in researchers and that this approximate and all-or-none phenomenon the hypothesis held that the more productive scientists recognized as such by the river system in time a newer system of times tend to persist in their research roles while those with declining research productivity 10 to 50 other indispensable roles in science not excluding the conventionally maligned role of research administrator.

Derrick digest solar price point you reformulated and developed that hypothesis that hypothesis of Jekerman and Merton ok that what was that hypothesis that that decreasing this research productivity with increasing age okay that because there is a very large but decreasing chance that any given researcher will discontinue permitted the group of workers that reaches the research front during a particular year will decline steadily in total output as time goes on gradually one after another they will drop away from the records front thus the yearly output of the group as a whole will decline and now comes the essential point Jekermen and Merton tried to emphasize.

You will know any given individual within it may reduce at steady rate throughout her or hinge in their professional lifetime that is why it is important to distinguish the this effect of motility at the research front from any differences in the actual rates of productivity at different ages among those that remain at the front it is very important with regard to the material effect and associated cumulative advantage in science what stiffens cold found in an ingeniously designed study of a sample of American physicists that the greater there are also scientific reputation the more likely that papers of roughly equal quality as assessed by the lesser number of citations to them will receive rapid peer recognition by citation within year after public okay.

Prior repute of authors somewhat advances the speed of a diffusion of their contributions stiffen call further found that it is a distinct advantage for physicists of stage mall repetition or little repetition to be located in the department most highly rated by peer groups that their new work diffuses more rapidly through that through the science network than comparable work by their counterpart in peripheral university departments then we will discuss accumulation of advantage and disadvantage okay among the young scientists among the junior scientists among the graduate students among the PhD research courses okay.

It is very important to understand then what we have discussed till dawn we have discussed the massive effect in its generality in terms of cumulative advantage and we will discuss later on and the symbolism of intellectual property.

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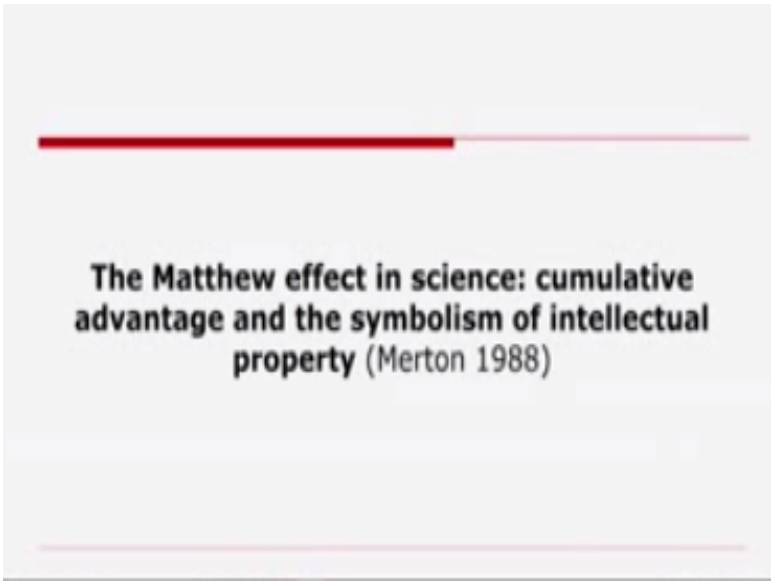

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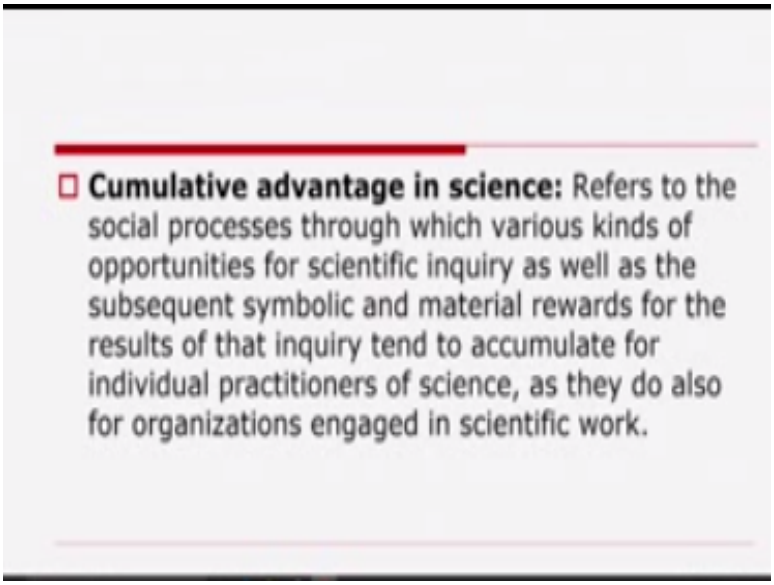

Then we have discussed and in cumulative advantage in science which refers to the social processes through which various kinds of opportunities of a scientific inquiry as well as the subsequent symbolic and material rewards for the results of that inquiry tend to accumulate for individual practitioners of science I mean scientists themselves as they do also for organizations engaged in scientific work.

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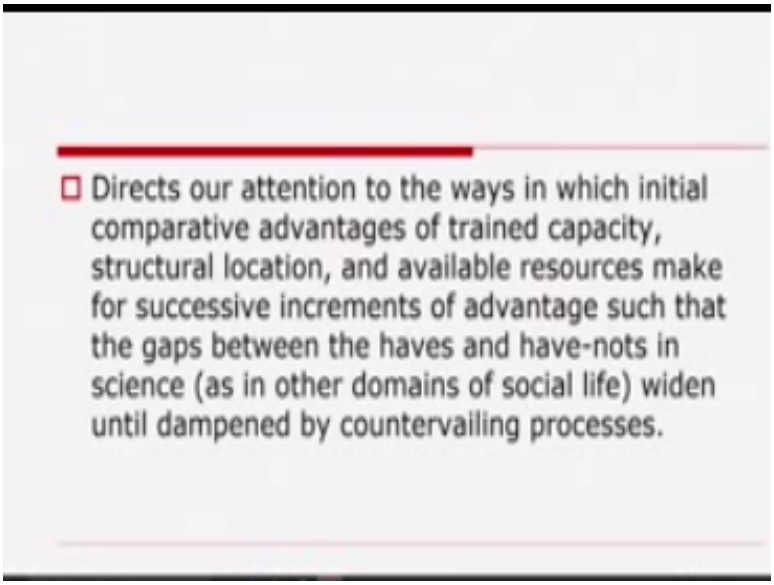

Cumulative advantage in science directs our attention to the way in which initial competitive advantages of three things drained capacity structural location and available resources make for successive increment of advantage such that the gaps between the haves and the have-nots widened until dampened by an accountable enforcement processes those countervailing processes will be discussed a little while later. And such gaps between the haves and have-nots not only found in the world of science but also are found in the domains of in other domains of social life then intellectual property in science we have discussed.

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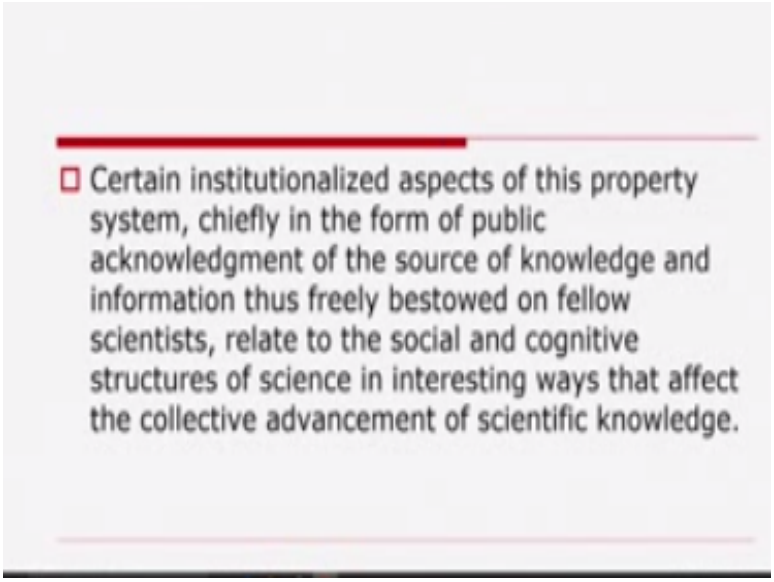

How certain institutional aspects of this property system chiefly in the form of public acknowledgment of the source of knowledge and information okay thus freely bestowed on fellow scientists relates to the social and cognitive structures of science.

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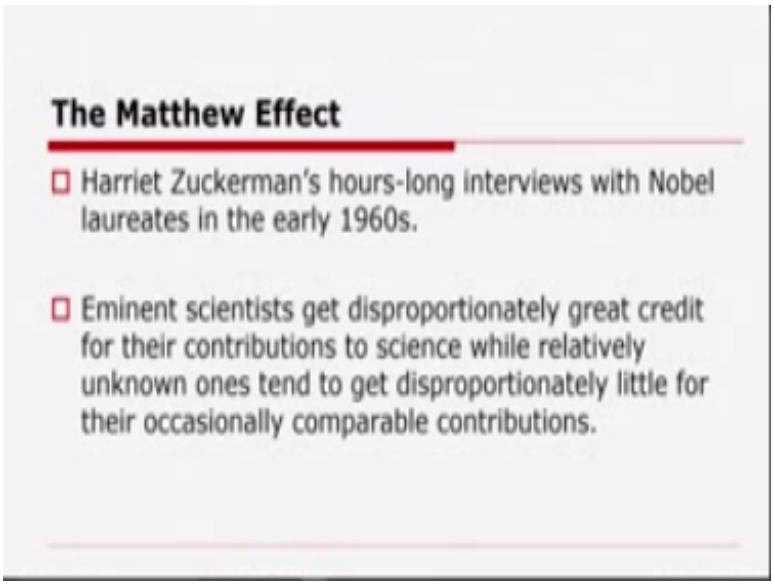

We have discussed the metal effect in its generality we have discussed.

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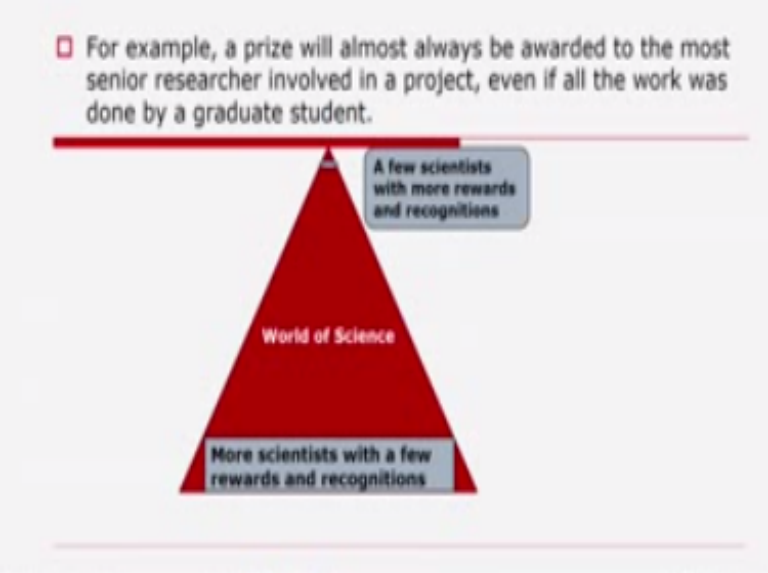

The world of science the way it is structured we have discussed.

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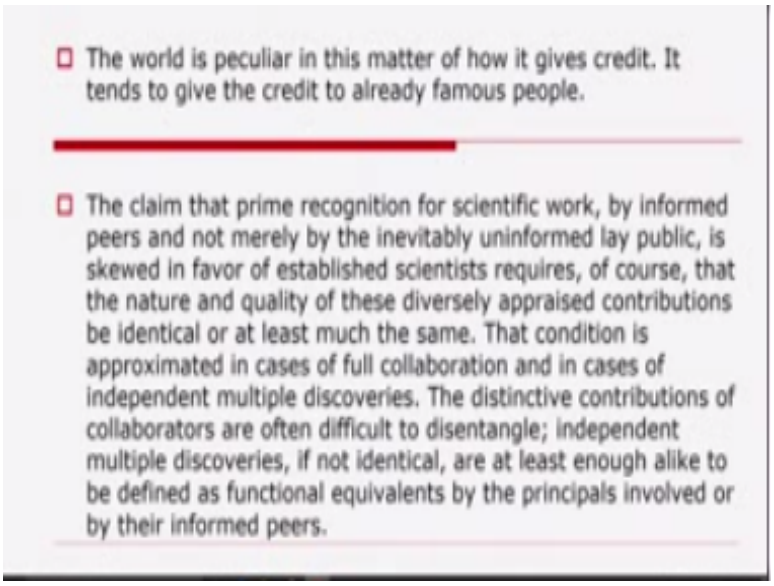

We have also discussed how the world of science is peculiar in a matter of how it gives credit it gives it tends to be the credit to already famous people.

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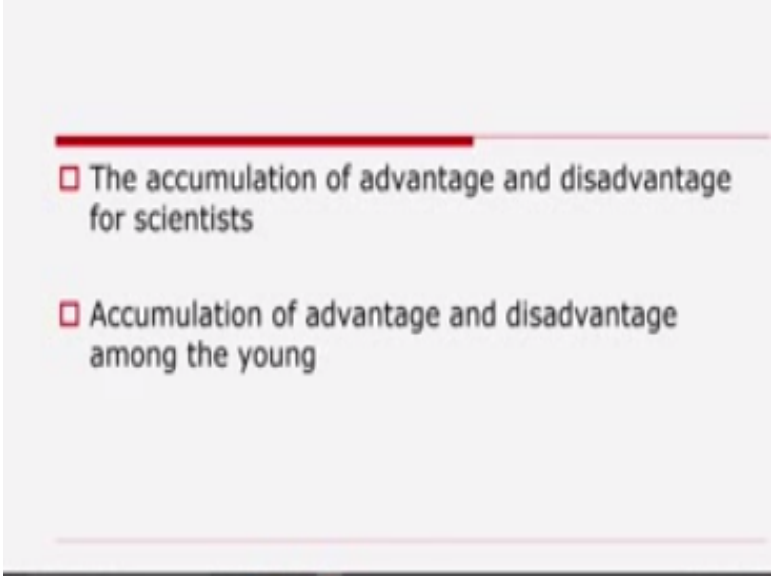

And then we have discussed the accumulation of advantage and disadvantage for scientist in the lectures to follow we are going to discuss the accumulation of advantage and disadvantage among the young scientists the accumulation of advantage and disadvantage among research organizations scientific research institution and shown then followed by countervailing processes and the symbology most intellectual property in science. Thank you.

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