

# THE MYTH OF "SOCIETY- INDEPENDENT" **REALITY AN EPISTEMIC PERSPECTIVE**

## ABSTRACT

Reality is humanity's perennial concern, and knowledge, considered as the only human product that may contribute to comprehend reality, is defined differently in different periods of the history of human thought. Most of the time it is thought that true knowledge reflects reality as it is, positivistic conception of scientific knowledge is very famous in this context. The paper discusses the problems of knowledge and reality from epistemic perspective. It deals with the issues of, what is knowledge and what reality, are they one and the same thing, or two different conceptions of the same author (man), when dealing with his surroundings. Is there a reality which stands out there as the object for our comprehension of it, or we are the major of what is real and what is not. In the early years of 20th century, there is the recognition that science is not looking at things in themselves, but at the structures of phenomena. In other words, science looks at the way in which we perceive the world. The paper is trying to figure out the fact that, man is the major of everything and, since every man belongs to a society, there is no society- independent reality.

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The concept of an objective world, not subject to humankind's knowledge of it, is nothing more than an illusion, observers are necessary, to bring the universe into being. There is no reality outside there, what we call reality, is not an independent objective reality, but a kind of reality that depends very much on us. Our surroundings are necessary for our living, but our ability to understand them, is the required spirit that keeps them alive. We are those who have to play the role of giving continuous freshness to reality, with our continuous process of understanding it, and this is what protects reality from death, thus a non- comprehended reality does not exist. If we accept and believe blindly in what is said about it than reality fades, and of course, dies. The uninterrupted interpretation of every generation of it, keeps it always real, alive, interesting, and fresh. In fact, the different interpretations of every generation of it reflect the infinite beauty and attractiveness, of the same reality, and the only way of the continuation of its existence. Our mind and the senses are the necessary constituents of our scientific penetration into reality, and our thoughts and interpretations, which are the product of our scientific penetration into it, are always unstable and open to question.

Creative imagination is the necessary beginning that directs every our scientific enquiry, for we all know that, every experiment comes after a hypothesis, and we would not have the experiment without prior having the hypothesis. Our ability to experiment makes the hypothesis true, but our inability to experiment it, does not make it false. Every experiment is done with a purpose. An experiment is an artificially planned practical action in order to achieve a particular result, with the intention of empirical confirmation of what we have in mind, i.e. the hypothesis. The equipment used in experiment is the personal choice of experimenter that, he thinks may help to achieve the result. Even the hypothesis as an idea is the property of the subject's mind. So in this case, both what we are trying to prove, the empirical equipment we use in order to prove and what is proved, belong to the subject or subjects. They may be more useful if we comprehend them as they are subjective, instead of transferring them into objective grounds or standards, in order to avoid the danger of becoming the obedient of standards, God is enough for obedience.

> The main task of researchers is to produce and create subjective thoughts and techniques that may be useful for other subjects not to produce objective standards for obedience. Successful research does not obey general standards; it relies now on one trick now on another, and the moves that advance it are not always known to the movers.<sup>1</sup>

Every scientific discovery or thought one day may be turned into an old fashioned and replaced by another one, and whatever the content of that discovery or thought, the message we can get from the history of the scientific development is very clear, don't be so sure about what you possess in the field of knowledge, you never know when you will become aware that, what you consider as knowledge, is nothing more than an opinion. Feyerabend notes in this regard:

> The methodological approach of research is not confined to small elites of highly trained scientists. Every day all kinds of people, including small children, try out new sets of connections between observations, or in other words, test new theories. A theory need not be particularly well thought-out or valid. It's enough that it applies for the moment, provided that the person finds it a useful tool to think with and the effects are reasonably harmless.<sup>2</sup>

It seems to me that science has no ability to offer us any help as far as reality is concerned. The invention of the concept of true knowledge was, in essence, a hope that, we thought it will acquaint us with reality concerning us and our surroundings, but we realize that, at least till now, this concept is useless in this context. We are rushing behind something we don't know how to reach it. Our mind and the senses, which are the only constituents of this path, cannot provide us satisfactory steps on this road. We are not even sure that whether we are stepping further or we have not yet taken even one step along this important path. Indications are such that, we have not even begun our journey on this important task, and the most confusing is the fact that, we don't even know how to make a beginning. We are part of the total game called universe (reality). Our efforts to understand reality which we call scientific activity is, in essence, the only opportunity that makes us feel as the part of the game. But we still are not sure whether science called activity is the required password to enter the game (reality). We think sometimes, when we make some important steps in science, that we got the password for the entrance, and become happy for some time but, after a while, a new discovery or thought which appears as "attention please wrong password" turns things around and takes us again into beginning. Every single revolution in science reminds us to one and the only classical reality regarding science which is that, science cannot unblock the windows for our epistemic penetration i.e. participation into the game (reality). The period of stability in science, or the

<sup>1</sup> Paul Feyerabend. Farewell to Reason (New York: Verso, 1987), 281.

<sup>2</sup> Jonsson Bodil. Ten Thoughts about Time (London: Robinson, 2003), 119.

period of normal science as Kuhn would say, gives us the feelings that we are doing well, but when the paradigm which dominates the stability period starts having problems and the problems gradually increase these again cause crises in science which can be solved only with the emergence of an alternative paradigm which is able to deal with the problems that cause the crises. When this new paradigm becomes accepted stability starts again. "There are many examples of paradigms being replaced in a scientific revolution. Perhaps the most obvious was the revolution that allowed the world of Newtonian physics to replace the older Earth-centered world of Aristotle and Ptolemy. Then, with Einstein's theories of relativity, the Newtonian physics, which had served science well up that point, gave way to a very different view of the universe", i.e., relativity. All interpretations are possibilities, included in the same whole that we call reality, which in essence, are the building blocks and the necessary constituents of the same reality. Our understanding of the world is influenced by the way we examine it and the questions we consider as appropriate for learning it. "Learning is not about once-and-for-all answers or exact repetition, but finding out about the variations that may or not lead to the same result".<sup>3</sup> We are not born to follow other people's words and understandings, as far as reality is concerned, but actively participate in the process of learning it, which is the only way of keeping reality fresh, real and alive. There is nothing around us which is not subject to our comprehension and understanding; it only depends on whether we decide to play our role which, of course, is a hard work, much harder than following the others. "Lows of nature" are not things that exist outside somewhere, they are not concrete entities, but descriptions of the relationships between concepts that human beings use in order to make sense of their experience.

All scientific methods, rules and knowledge yielding procedures are invented by people. "The knowledge we need to understand and to advance the sciences does not come from theories, it comes from participation".<sup>4</sup> "Scientist can thus no longer say: We already have the correct methods and standards of research – all we need to do is to apply them".<sup>5</sup> Our main duty is to try inventing new, more useful, procedures and not follow the old fashioned and, who knows how much useless methods, compared to those that are still not invented and wait for our exploration of them. The only way of showing the next generation that we have done something is through breaking old and inventing new procedures of knowing. The only necessary guide we need in this context is freedom and hard work. Invention is a sign which shows to younger generations that, we have existed and done something. Researchers of whatever areas, most of the time, are not running behind truth, for the sake of truth, as Aristotle would say, when they do research, but their real aim is to please somebody or some institution or to fulfill the needs of the investors or power holders, because this is the only way how the researchers may survive. Almost every research is done with a purpose but, I don't think anyone can deny the fact that, every research has its meta-purpose as well, which in essence, is closely linked with the personal interest of the researcher and / or the investor. The whole research process is couched in a "win / lose" framework in such a way that, if the researcher or the investor or both, win than the research becomes a success. But whether the research will contribute to the public good or to the truth is, either rarely or not included at all, in the agenda of the research project. Thus every research of every researcher is serving either power or money holder.

Life has no mercy, it keeps us always busy with necessary things to be done for our survival, and it never lives room for a duty free action behind the truth. Every our trial to find or know the truth, is conditioned in such a way that if we overpass them we can never succeed. As it is very clear from the history of scientific development we make progress in knowledge with getting rid from the thoughts and interpretations of our predecessors. We too have to play the role of useful predecessors for the next generations. Our thoughts, procedures, inventions and interpretations are no more than the fundamental constituents of the ground of which the new generation will try to get rid of, or at least correct and, continue the way of progressing towards knowing the truth.

Man is the measure of everything, only immature people work on objective standards and measures. A university should not employ academicians in order to apply its standards on them. "Laws, theories, basic patterns of thinking, facts, even the most elementary logical principles are transitory results, not defining properties of this process. Scientists, accordingly, are not obedient slaves who on entering the Temple of Science anxiously try to conform to its rule... they forge ahead and constantly redefine science (and knowledge, and logic) by their work". <sup>6</sup> We have to be aware that standards are subject to test and inspection by academicians. We should not value academicians according to their loyalty to the classical rules and procedures but, create the atmosphere for their contribution to the promotion of creativity among themselves and the students, which is necessary for knowledge yielding procedure. "It is especially

Ibid, 22.

Paul Feyerabend, Farewell to Reason, op. cit., 284.

<sup>5</sup> Ibid, 284.

<sup>6</sup> Paul Feyerabend, Farewell to Reason, op. cit., 188.

important to be forward looking in the context of education. Oddly enough, we often focus on preparatory knowledge, i.e. past knowledge. This is undeniably useful, but deals only with what has been. The crucial words to keep in mind are those which point ahead: expectation, hope, intention."7

Every academician should act as a self-relied contributor and, not as a procedure relied preventer of creativity, upon which human progress directly depends. Administrators, rules and procedures act as the board of trustees that strive to make existing rules and procedures untouchable, which is the only way of strengthening their positions as authorities to be obeyed by the staff. It is very important to create the atmosphere of trusting the academicians and consider every academician as a possible self-contributor to knowledge. Progress in knowledge is the result of the efforts of the individual researchers in the field. You cannot have individual society, where people think and decide based on individual interests, if the individuals have no economic independence. Non-developed societies are economically family dependent so that, they cannot pass family borders in thinking and behaving, even if they think they have to. If we want a prosperous society we have to come up with laws that create conditions that make possible individual life, which is necessary for individual prosperity. Only protected individuals can achieve and create miracles. Individual freedom demands necessary conditions for individual sustainability and a law that will guarantee and do everything for the protection of these conditions. We are different as individuals and, every single difference that we possess, is a potentially possible contribution for our progress, if we will be able to create conditions for its actualization. The characteristics of a successful scientific community are to be found in the efficiency of the individuals in their critical stand towards every government, institution, organization and individual that does not play the role of strengthening the philosophy of respecting the others in the society. Two or three flowers cannot bring spring. Give the chance to every difference to flower if you want to have a flourishing society and a peaceful life. Greek science and culture achieved its pick when they became intermingled with the Egyptian civilization. The flourishing of science and scientific society in the Muslim world appeared after Muslim invasion of Egypt where they got into contact with Greek science and culture. The building blocks of scientific and rational society in Europe started when Egyptian, Greek and Muslim science entered Europe, with the help of universities and schools opened by Muslims after their invasion of Spain.

The lunar models of Copernicus and the Maragha School are identical". It is this essential equivalence of models that prompted Noel Swerdlow to ask "not whether, but when, where, and in what form" Copernicus learned of the Maragha theory.<sup>8</sup>

A real scientific society is a society that strives to help and benefit from others because they are aware that the necessary treasure for humanities progress lies in differences. This is the essential of a scientifically minded society. A scientific, or rational society, is not a society where majority of the population are scientists, there is no such a society, but it is a reasonable behavior of the majority of the individuals of the respected society, which can only be the product of the influence of the scientific community upon the lives of the mass, of course, if the scientific community can be successful in this context. Every new discovery or thought in our way of acquiring knowledge may, at the same time, play the role of preventing or, at least slowing down, the speed of progress in the field, and this happens when we impose it to others, especially to our students, with the procedure of officializing it in our institutions. Scientists and academicians are not servants of official views but they have to do their utmost to protect every scientific thought from the poison of officialization. We are in need of permanent unofficialization of the mentality of "official science".

> Science is thus the natural enemy of all vested interests-social, political, and religious, including those of the scientific establishment itself. For the scientific mind refuses to let things stand as they are. The organized skepticism of the scientific ethos is ever present and always doubtful of the latest (and even the long-standing) intellectual consensus.9

The re-entrance of Greek science intermingled with Muslim additions and interpretations of it in Europe, paved the way of progress for Europeans. The message was very clear, if you want salvation change the direction, fallow the path of reason, use your mind and learn if you want better and prosperous life, and this is what happened. It was not an easy task but finally they succeeded to change Europe.

<sup>7</sup> Bodil Johnson. Ten Thoughts about Time (London: Robinson, 2003), 136.

<sup>8</sup> Haff E. Tobby. The Rise of Early Modern Science (Cambridge: Cambridge University Press, 1993), 54. For more see Noel Swerdlow and Otto Neugebauer, Mathematical Astronomy in Copernicus's "Derevolutionibus" (New York: Spring Verlag, 1984), 46, 54.

<sup>9</sup> Toby, The Rise of Early Modern Science, op. cit., 1.

Europe in the eleventh century without that tradition was as fresh, young, and naïve in comparison with Arabic-Islamic civilization as the United States was in comparison to Europe in 1776. (Europeans)...began to encounter the rich intellectual heritage of the Middle East (largely in Spain), they quickly became enthusiasts of and promoters of the wisdom of their "Arab masters". (the contact of Europeans)...with Arabic-Islamic culture in the twelfth century produced a renaissance in Europe.<sup>10</sup>

What Muslims brought to Europe was the key of progress and prosperity and that was the order of the revealed book. It is the Qur'anic order to help others to become rational. Thus Muslims were aware that in doing all these they were in reality worshiping God. It is not an easy thing to keep open the doors of progress in a society, and the process of opening them, when they are totally closed for it, is the most difficult one, it always starts with clashes and demands sacrifices. This is what happens in the Muslim world of today. What accelerated the process of Muslim-Arab world's massive demand for a rational and democratic society is the entrance of western internet and computer science into the Muslim world. The intermingling of the middle Ages minded Muslim- Arab world of the 21st century with the contemporary western internet mode of living and behaving brought the spring to the Muslim world. Scientific development is the result of human desire to achieve some purpose. Essentially, the main task of science is to find the unreasonable aspects of all reasonable justifications, we think we possess. We are neither learning nor teaching the truth in our universities. We just impose to students the opinions of the influential minds and schools. "The sciences of today are business enterprises run on business principles. Research in large institutes is not guided by Truth and Reason but by the most rewarding fashion, and the great minds of today increasingly turn to where the money is -which means military matters. Not 'Truth' is taught at our universities, but the opinion of influential schools".<sup>11</sup>

All what is required from a student, in order to be considered a successful one, is what is in the text books and, a well prepared teacher or lecturer is the one who's views do not clash with the texts in the field, in both cases the text is the one that decides and not the subject or subjects. "While objective thought, writes Kierkegaard, translates everything into results and helps all mankind to cheat, by copying these off and reciting them by rote, subjective thought puts everything in process and omits the results; partly because this belongs to him

10 Ibid, 99.

who has the way and partly because as an existing individual he is constantly in process of coming to be, which holds true of every human being who has not permitted himself to be deceived into becoming objective, inhumanly identifying himself with speculative philosophy in the abstract".<sup>12</sup> Wittgenstein took the view that the function of language is to picture the world. For him the totality of true propositions is the whole of natural science. Thus science has to do with propositions not with external things. Science is a network of words, ideas, mathematical calculations, formulas and theories, it is a form of language, and language is nothing more than a human construct. Galileo thought that the book of nature was written in the language of mathematics, but this was not a new idea, Pythagoras (570-497) had argued long ago that everything could be given an explanation in terms of mathematics.

Feyerabend pointed out that we are constantly interpreting experience and that our interpretation is linked to all the rest of our experience. Interpreting is part of the process of observation. Phenomena may be interpreted in a variety of ways. Our main concern in this context will be how we will decide between alternative interpretations. Lakatos pointed out that: the direction of science is determined primarily by human creative imagination and not by the universe of facts which surrounds us.<sup>13</sup> Theories are not out there waiting to be discovered, they are human creations; instruments to be used in the process of understanding the world and, a "blind commitment to a theory is not an intellectual virtue: it is an intellectual crime".<sup>14</sup> We cannot reject different interpretations and views just because they clash with the actual situation, or official science; the answer we get depends on the question we ask, the act of investigation itself influences what is investigated, and a text could mean whatever one chose it to mean, with no ultimate criterion of interpretation. In 1967 Barthes proclaimed the death of the author; readers create their own meanings, regardless of the author's intentions: the texts they use to do so are ever-shifting, unstable and open to question. The anthropic and the participatory anthropic principle (PAP) go even further and suggest that: observers are necessary to bring the universe into being. If there weren't any conscious humans, there wouldn't be any universe. According to the anthropic principle human consciousness is somehow fitted to the universe, not only as a component but as an observation necessary to give the universe

<sup>11</sup> Paul Feyerabend, Farewell to Reason, op. cit., 102.

<sup>12</sup> Soren Kierkegaard. Concluding Unscientific Postscript, D. F. Swenson and Walter Lowrie, eds. (Princeton: 1941), 68. As it is cited in Paul Feyerabend, Farewell to Reason, op. cite, 153.

<sup>13</sup> From his collected papers, published in 1978, four years after his death. 14 Ibid.

meaning. Quantum physicist Niels Bohr, "proposed that no phenomenon can be said to exist unless it is an observed phenomenon".<sup>15</sup>

That a theory seems relevant to the interests of one group does not guarantee that it will be relevant to others. "There is no monolithic entity, 'science', that can be said to clash with things, and 'the modern situation' is a catastrophe that offends our most basic desires for peace and happiness."<sup>16</sup> Science, as it is very clear from what is going on in our universities, is a tool in the hands of power holders in order to legitimize their deeds. Scientific communities national academies, universities, academicians, lecturers, assistant lecturers are all serving each other hierarchically according to their ranks, and the link as a whole, is unconditionally in the service of the interests of the few at the top. The whole hierarchy in universities, paid by people's money, in order to promote knowledge and educate the youngsters of the tax payers, is part of the civil servant department and, no civil servant department cares about what they are paid for by the law, in non-developed countries, because the authority that hires them, in this part of the globe, is not the law but, political parties in power. Thus, in these countries power-holders are not obedient of laws, as it has to be, but laws are in service of a few, i.e. political parties in power. Is the concept "scientific", which qualifies knowledge as the best of its kind, and "scientists" as nobles and selected creatures of human kind, a better way to follow the truth or an obstacle which has to be replaced by another, more fruitful one, which may ease our way towards understanding reality, we are not sure, but the consequences of the philosophy of "whatever is scientific is good" are very obvious, it has only paved the way for the scientists to manipulate with the rest of humans and, for the west to dominate and destroy other cultures and ways of thinking.

I think it is time of getting rid from this old fashioned relic of the modern era which is bothering our minds with centuries, claiming that its main concern is true understanding of reality, and playing only the role of the tool in the western hands in order to officialise its attacks on non western societies, when the history of scientific development obviously shows that there is no "society- independent reality". The concept "scientific" has become old fashioned and problematic, regarding our progress in knowing the truth. Scientific development, produced scientists, not knower's of truth, a new profit based community, which only cares how to profit from people and never thinks of reality. Scientists always speak of good, happiness, humanity,

"but what they mean are they themselves and those few select creatures who can understand their papers: So, u see, you are in excellent company".<sup>17</sup>

Profit is the main purpose of every scientific endeavor; non-profitable departments in universities are getting closed every day. Profit is not essentially bad, but nobody wants it for its own sake, it is desirable for other reasons, and these reasons are closely linked with the narrow interests of the scientists. Scientific knowledge is serving the interest of scientists and the investors. Experts

> ... do not study all phenomena but only those in a special field; and they do not examine all aspects of these special phenomena but only those related to their occasionally rather narrow interests. It would therefore be foolish to regard expert ideas as 'true', or as 'real' - period - without further studies that go beyond expert limits. And it would be equally foolish to introduce them into society without having made sure that the professional aims of the experts agree with the aims of society. Even politicians cannot be left unattended, for thought they deal with society as a whole they deal with it in a narrow way, being guided by party interests and superstitions and only rarely by what others might regard as ' true knowledge'.18

People instinctively unite knowledge with what is righteous. They all define knowledge as good in itself, but knowledge is a human property, humans have interests and they misuse it. The problem is who will define the proper cause of acquiring knowledge and the proper use of it. We all agree that knowing is good and knowledge has to serve the good, but who will define the good that knowledge will serve? Will we succeed if we leave this task to the scientists and scientific institutions? When it is very obvious that scientists and scientific institutions care for their good not for the good of humanity, and why should they care about humanity? No one comes to life with the purpose of serving humanity (or somebody). Coming to life is not even our choice. The question of: why we are in life, what is life, we are in life or life is in us, who we are, are questions that life imposes to us after a period of time. Just few people are unfortunate or, perhaps fortunate, and die before that period of life comes.

Is knowledge defined as "good in itself", without considering the purpose of its being acquired and the effects of its being used, enough for the good of human kind? I guess every

<sup>15</sup> Richard Appignanesi, Ziauddin Sardar, Patrick Curry and Christ Garratt. Introducing Postmodernism (New York: Totem Books, 1995) 110.

<sup>16</sup> Paul Feyerabend, Farewell to Reason, op. cit., 141.

<sup>17</sup> Ibid, 277.

<sup>18</sup> Paul Feyerabend, Farewell to Reason, op.cit, 56.

one's answer would be no. if we define this good as knowledge for its own sake as Aristotle did, this is not clear, because a delight is not delicious until it is tasted. Knowledge cannot be acquired for its own sake, but for the sake of what we want to achieve with it. Our success lies in our ability of turning it into a useful and beneficial product for humanity.

The problem is how and when knowledge becomes a benefit for humanity. "Most important of all, it is in this century that we discovered how to release enough energy from the atom to destroy our civilization in minutes, this before we learned how to live together on the same planet. This is the century in which technology advance outstripped social advance." <sup>19</sup> Western conception of knowledge as power i.e. the unification of the goals of knowledge with the goals of power, as Foucault rightly maintains, transferred scientific and technological development into a disaster for humanity.

If power is the reason of our advancement in knowledge, than, power becomes the master of knowledge. Power is not actually bad, but when it is desired as an end in itself, domination over the others follows necessarily; in fact, domination is a sign of its existence. Domination and control are the natural properties of the power for its own sake, they are the natural consequences of its existence as well, and otherwise nobody would be interested in power, for, what would be the use of having it. It would be foolish to possess something of no use; nobody would like to have it. Domination and control are, at the same time, the only ways of our experience of power. If not human willingness to use the others, what would be the use of power, the others constitute the natural reason of our desire of having it. Knowledge in service of power is humanity's most dangerous property; happiness is the result of human successful attempt to put power in service of, not just knowledge as such, but knowledge which constantly will serve the master of its necessary constituents.

Knowledge is the result of the operation of our mind and the senses upon the given, if not the given we would not be able to acquire it, since this is the only way of our acquisition of it, then it becomes a given, it is the end-product of the relationship of the two givens, the act of nominating it as given by God, or by nature, depends on, who's God is who. It is a property of our operation with our senses and mind upon nature, in this sense, knowledge is given by God means, the necessary constituents of our act of acquiring it, are given by God. Both, the ground, upon which we operate and, the instruments, with which we operate, are two givens without which, knowledge yielding procedure would not be possible. What remains as our property is only the act of our acquiring it, of course, if we decide to acquire it. We would

not be able to claim that we possess any knowledge without that ground and, our ability to operate upon it, neither the ground (nature), nor the ability to operate (our mind and the senses), belong to our acquired properties, every one of us consider them as the givens, our only possession is the choice of using both of the givens in order to end up with knowledge, this is what knowledge, as God's mercy to humanity means, and it remains as mercy when it serves its only giver. It is the old Christian tradition which inspired modern European mind to run for certainty in knowledge, and the end of the race was logocentricism, a perfectly rational language that perfectly represents the world. Logocentricism is nothing but, the revival of the famous Christian doctrine of the word's being the truth of the thing, I. e. word made flesh. The only difference is in authority, in modern time, scientists occupied the position of Jesus and the saints; however, the position of the medieval church, was given to the modern temple of obedience, called academia of sciences. Having once accepted the biblical accounts literally, we now accept science's finding literally "It isn't Nature that evolves slowly and peacefully but science itself: That theory of uniformity is a projection of academia unto nature."<sup>20</sup>

The reason of the secular's strong resistance to the sacred is the fear of losing their hard earned and, already well established sacredness, camouflaged with modernity and rationality. Rationality is an invented license of the modern west, to a naturally non-perfect western human being, to perfectly speak about everything. What a rational conception of rationality, a non-perfect observing subject, equipped with perfectly rational language, will perfectly represent the world. Western efforts to offer universal scientific truths about human nature, are nothing more than, mere expressions of ethical and political commitments of western society, to establish its hegemony over the rest of the world.

<sup>19</sup> Simon Ramo. The Business of Science (New York: Hill and Wang, 1988) 3.

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