

## Phenomenal Consciousness and its Role in Science

When we attend intently to ourselves, what do we experience? Our phenomenal consciousness caught in the act of experiencing the world. What distinguishes this consciousness from the world it is experiencing? A difficult question; consciousness is *here*; it is perceiving, feeling, sensing; in no way is it nothing. Yet, if everything being perceived, felt, or sensed is subtracted, what remains is, in a certain sense, nothing. However, if nothing, really nothing, remains after everything that is the object of experience is subtracted, then the act of experiencing would itself be nothing, nothing at all. We become aware that this act of experiencing is a reality of its own because the world as we know it disappears together with its disappearance; and only in perceiving, feeling, and sensing that something occurs does it exist for us. Because we do not know what "being there" would mean were it completely dissociated from "being here," it is very hard for us to say what remains of phenomenal consciousness when everything that is manifest in it has been subtracted from it. Only if we could express this would we be able to define phenomenal consciousness as such.

Our phenomenal consciousness is simultaneously something we know most intimately and something completely alien to us. It is what we know best of all because it is fully present to us in every act of experiencing. Yet it is completely alien to us because we cannot grasp it in its own reality, we cannot get to know it better in the ordinary way. It eludes our grasp, it is not a thing we can experience with our five senses. We can only experience phenomenal consciousness by taking cognizance of ourselves, a cognizance that involves the realization that there is no viewpoint apart from itself from which it can be viewed. It can be experienced only in a state of *self-awareness*. To reach this state, we must rupture the everyday intimacy we have with our phenomenal consciousness, an act for which there are no words. When phenomenal consciousness partakes of itself, something mysterious is inevitably involved.

Is there any sense in attempting to speak about phenomenal consciousness in ordinary language? The difficulties encountered and the number of failed attempts seem to answer the question in the negative. A skeptic would base his answer on the fact that such talk would have to clarify what exactly is meant when consciousness is present. But there are very few concepts which have resisted authoritative clarification as stubbornly as this one. The most resolute attempts to understand phenomenal consciousness *per se* leave speech behind. They follow the path of meditation and contemplation; they are guided by the intuitive hope that, when everything occurring *in* it has been eliminated from it, something will remain. Self-awareness achieves its goal by experiencing as consciousness itself the emptiness at which contemplation arrives. As a consequence of this achievement, self-awareness becomes aware of the meaning of empty being, or filled nothingness, a residue that nevertheless remains *here*. Self-awareness does not arrive at this state by self-reflection; consciousness does not experience itself in itself by turning its conceptual apparatus toward itself. It *arrives* at itself as something unequivocally ultimate. However, what it arrives at is not the absolute consciousness of Western philosophy. It is, in a word, the soul experiencing its own nature.

The word soul is important here; it points to the fact that some intuitive access to the *here* of attentiveness exists. We all know what we are talking about when we use the word soul in everyday conversation. This knowledge has survived all misuses of the word and all attempts to translate our intuition into conceptual thinking. We do not have to be philosophers or acolytes to understand what we are dealing with. A soul in the sense in which every child understands it is *here*, when we perceive, when we feel, when we sense. Beings endowed with souls are those whose perceiving, feeling, and sensing cannot be reduced to information extracted from stimuli.

The way we use the word soul encompasses the way in which we select other beings to whom we attribute a soul. Our intuitive knowledge that our body is animated by a soul has the practical consequence that we attribute to other beings with whom we feel related an ability to perceive, to feel, and to sense that goes beyond information processing.

Attributions of this kind are regarded as unscientific. It is the self-defined characteristic of science that it can prove its assertions. But talk about souls is at odds with both empirical evidence and logical proof. My own consciousness may be self-evident, but there is neither empirical evidence nor strict logical proof that another consciousness exists. The reports we get about other psychic life are bound to be subjective. They always and necessarily fail to provide strict evidence that what is being reported actually exists. We certainly have good reasons to mistrust reports about others' psychic life. Up to a certain point the skepticism exhibited by science is justified, but science makes a mistake when it carries its mistrust so far as to deny that psychic life has a reality of its own.

The following discussion takes this denial as its starting point. Its thesis is that science is doing itself no favors by this denial. Science excludes the most interesting aspects of its self-image when it eliminates everything related to the common presupposition that human beings are endowed with a soul. This is because science is a perfect example of a closed economy of attention in which the presupposition that there is phenomenal consciousness other than one's own is vital; this economy works in spite of the lack of theoretical proof - indeed completely independently of it. In science we can observe very clearly the great significance that the inter-personal exchange of attention has. That scientific research functions like an immaterial economy is not an inessential attribute; rather, on it depends the demonstration that science is an economically rational undertaking.

### *"Attention" and "Consciousness"*

To proceed with our argument, further conceptual clarification of phenomenal consciousness is indispensable. Although any attempt to give a clear-cut definition of the terms "attention" and "consciousness" is bound to fail, we cannot do without these concepts when discussing manifestations of the psychic. In order to prevent confusion

due to inconsistent use of these terms we ought to differentiate between two shades of meaning in both of these terms that are often used interchangeably.

Where German has one word, "Aufmerksamkeit," English has two: "awareness" and "attention". Awareness denotes a state of alertness, while attention means watchfulness directed at something. Awareness denotes the state of just being *here*, a state in which perceiving, feeling, and sensing occurs. But since perceiving, feeling, and sensing are also nearly always – with the exception of the radically different state of filled emptiness – directed at something, the distinction between the intransitive and the transitive aspects of these two words is not immediately apparent. A line drawn between pure phenomenal consciousness by itself and watchfulness directed at some object may even appear somewhat artificial, because this distinction can only be made analytically. But while awareness is – above all – intransitive, attention is clearly and exclusively transitive.

Attention is clearly restricted to mindfulness directed at something, to focusing on and singling out some object; it can be described accurately as the selective reception and target-oriented processing of information. But the selective reception and target-oriented processing of information need not invariably go hand-in-hand with a state of consciousness: attention need not involve awareness. While intransitive consciousness is regularly connected with a certain transitive watchfulness, watchfulness itself is not exclusively tied to a state of consciousness. The number of stimuli that our nervous system filters out is larger by many orders of magnitude than the number of stimuli it presents to conscious perception. The nervous system also extracts far more information from those stimuli than it permits us to perceive, feel or sense. Obviously, it continues operating when our thoughts are elsewhere, or when we are not mentally *here* at all. After all, being *here* or being elsewhere constitutes at most different processing modalities to the nervous system viewed as a processor of information. Selective reception of stimuli and target-oriented extraction of information rely so little on a state of consciousness that they can be delegated to machines. In this book, however, attention will always refer both to the capacity for selective information processing and to alert mental presence. Mental presence will never just mean readiness for information

processing or activation of background knowledge, but always, simultaneously, phenomenal consciousness.

Given all this, wherein lies the difference between attention and consciousness? The difference is rooted less in what they refer to than in the context in which they are usually employed. We tend to speak of consciousness when language and, specifically, when the word "I," plays an essential role. On the other hand, we speak of attention when discussing selective perception, or inter-personal perceiving, sensing and watchfulness. The distinction between the two terms becomes clearer if we compare their related reflexive expressions. Being conscious of oneself is quite naturally associated with abstract thinking and the theoretical reconstruction of the self; self-awareness, by contrast, is associated with heightened states of contemplation, or even with forms of introspection that do not rely on concepts. These differing facets only confirm that consciousness and attention do not denote something fundamentally different.

The differences, although not easily discriminated, must still not be disregarded. Consciousness and attention are not interchangeable terms; the term consciousness has become ambiguous through overuse, partly because of its strong relationship to abstract thought and the self-articulation of the "I," partly because of the habitual disregard of the semantic differences between phenomenal consciousness and information processing in scientific and, unfortunately, also in philosophical debates.

Two aspects of consciousness must be differentiated. In its normal state of alert presence, phenomenal consciousness always means consciousness *of something*. As a consequence, consciousness and attention share a common semantic core. Consciousness, however, is not "attentional", but "intentional." The difference between the two corresponds roughly to the distinction between "taking note of" and "meaning something by." We become aware, again, of the strong linguistic connotation of consciousness. Unfortunately, characterizing consciousness as intentionality is unsatisfactory. It over-emphasizes reference to something intended and fails to reflect its extensive range and the clarity of its contents. It insufficiently expresses the varying

degrees of conscious awareness. For all these reasons, the term has justly been criticized.

Consciousness is not only concentrated, exclusive thinking of one particular thing. Between the flash of clarity when one is startled and the obscurity of dimly perceived background knowledge there are many gradations. The sequence from conscious foreground to subconscious background is nearly unbroken. Actual consciousness *of* something is usually experienced as a colorful, constantly changing mix of contents present in greatly varying degrees of intensity. This complexity of consciousness is not connoted by the term intentionality. Since that term has already been introduced, however, and because of its relation to the contrasting term attentionality, it will not be discarded for the moment. Consciousness *of* something will be called *intentional* consciousness.

The negation of "conscious" in the intentional sense is "*subconscious*". But that is not its only possible antonym. The opposite of conscious in the intransitive sense is *unconscious*. In a state of unconsciousness, it is not that something or other is not conscious; rather, consciousness as such is not *present*. The difference is the same as that between directed awareness and phenomenal consciousness. In the first case, objects appear more or less clearly, while in the second the screen on which these objects appear is either there or missing. If something is *subconscious* for us, the subjectively experienced world still continues to exist. In the case of unconsciousness, that world is simply not there. However, intransitive consciousness also occurs in varying degrees. We are *here* in a different way when we are refreshed after a good night's sleep, or when we are exhausted and almost falling asleep. And we are *here* in yet another way when we are dreaming. We are probably not *here* at all when we are in a state of deep, dreamless sleep or under anesthesia. There is practically nothing left to be *here* in a state of coma, and nothing at all in the case of death. These are all differences in *presence* of the sphere of experience in its totality rather than differences in this sphere's composition. The intentional content of consciousness will vary due to varying degrees of presence as well, but this variation is secondary.

Intransitive consciousness, or mental presence, is a *phenomenon* in the true sense of the word. It really appears but it does not exist independently of the act of appearing. Phenomenal presence is not the same as the act of representing the contents that appear in it. In other words, intransitive consciousness must not be confused with what is perceived, felt, and sensed in this state. It is the occurrence itself of perceiving, feeling, and sensing, an occurrence therefore properly denominated *phenomenal* consciousness. Differentiation of the terms intentional and phenomenal is indispensable for the conceptual clarification of "consciousness." At the same time, the distinction shows us why science has so much trouble with phenomenal consciousness. We must accept the fact that consciousness in the phenomenal sense of the term is accessible only from within, from the perspective of its subject. In the third-person perspective it is gone. What appear are subjective reports, not what the reports describe. It is true that, by exchanging such reports, we believe to have access to another consciousness; but upon closer scrutiny this access turns out to be a conjuror's trick; it is nothing more than an analogy from one's own to another's experience. No one has ever inspected another's phenomenal consciousness.

Anything that is to become real for some consciousness must appear in that consciousness's own experience. There is no door leading out of one's own consciousness, and no window allowing entry into another's. The other consciousness is always a projection of one's own. Our subjective sphere of experience is a windowless monad; every consciousness is a world unto itself. In this world all things occur that become real in consciousness. Even the idea of a reality independent of being experienced consciously only occurs within that consciousness. There is no exit from phenomenal consciousness short of death; neither does it have any entrance other than birth. Leibniz, the creator of monadology, thought that only the omniscience of a supreme monad, God, whose consciousness would encompass everything and thus also the totality of all individual monads, could establish some connection between the individual instances of consciousness.

Leibniz's monadology is a bold sketch of a cosmology that proceeds, not from physical reality, but from attentive presence as the primordial constituent of reality. It

exemplifies what science would be confronted with if it tried to incorporate phenomenal consciousness into its world view. Neither the first- nor the second-person perspective counts in science; science is bound to the anonymous perspective of the third person. For Leibniz, this is the perspective of omniscient God. Is science, therefore, not bound to deny the phenomenal aspect of consciousness?

The answer would be unequivocal if there were not two aspects that the monadology failed to take into consideration. Contrary to what Leibniz thought, the assembly of monads is connected with each other, and not just by the attention of an omniscient God. In addition, the rationality of the scientific enterprise hinges on the routine naturalness of the scientists' presupposed access to other consciousnesses.

### *Organized science: a struggle for attention*

Although we know that we actually do not have access to other spheres of experience, we also know that we are not alone in our own. Otherwise, we could not bear being in it. Even before we learn to think, we populate our inner world with other conscious beings. Children who are unable to do so become mentally ill. Autism is the result of an inability to distinguish between objects that have a consciousness of their own and others that probably do not. People suffering from autism live inside a windowless monad. In the case of everybody else, the question of whether and how one gets access to another consciousness usually arises only in retrospect; people stumble upon it when the naturalness of contact with other consciousness is interrupted by some unusual difficulty or by theoretical reflection. Difficulties after the event, not original successful access, stir up questions.

Still, the view we have of another's experience is indirect. When another's attention is turned toward us, we cannot experience directly either his internal processes or their motivation. We can infer the nature of these experiences only from outward behavior.



And we can never exclude the possibility that we are being deceived or that we are victims of our own projections. What we discover from another's behavior is what we put there in the first place. Therefore, doubts are always justified, particularly fundamental ones. Indeed, what criteria do we have for testing our interpretations? What evidence do we have for the phenomenality of another's experience? What difference would it make if the source of another's behavior were not meaningful subjective experience?

These theoretical questions have been taken very seriously. Many of this last century's philosophical controversies revolve around the epistemological status to be attributed to the hermeneutic interpretation of another's behavior. Can such interpretations be recognized as scientific or are they, at best, just a form of disciplined guessing? May we presuppose a subjective inside view when investigating behavior that, in the course of everyday interaction we *understand* in the light of some intention, or does this mean we are succumbing to unfounded speculation? Is science condemned to ignore the inside view, or is it at least allowed to assume it for heuristic purposes? This debate has been carried on, variously, under such rubrics as dualism of the natural sciences and humanities, understanding versus explaining, the controversy over positivism, the logic versus the psychology of scientific research. The central thread running through all these debates is the excluded and yet indispensable access to another consciousness. Time and again it has been compellingly demonstrated that, while scientific objectivity excludes the recognition of phenomena as real, scientific research cannot be carried on in the absence of such recognition.

What this endless debate shows is that an unbridgeable gap separates one's own and another's experience. There is something whose existence we cannot prove, something that nevertheless we cannot dispense with. It is wishful thinking that establishes the connection, but wishful thinking that everybody nevertheless engages in. Though each of us is isolated in our own monad, we live as if we were not alone at all; it is as if there were a God we could trust to hold the cosmos of monads together. This trust has the desired effect because everybody participates. It works as in the fairy tale: everybody behaves as if the emperor *were* wearing clothes. Or, more accurately, the fact that the

clothes are missing has no practical consequences, it remains purely theoretical. Science permits itself to doubt the reality of phenomenal consciousness but easily shields itself from the practical consequences of that doubt.

A basic ingredient of a researcher's social competence is his ability to differentiate between two roles, that of a test subject and that of a colleague. The difference does not lie in the fact that we cannot conduct research on our colleagues. Rather, it is that the consciousness of the test subject, but not that of the colleague, can be treated as if it were nonexistent. It is impossible to doubt whether the colleague is *here*; no one will take seriously the suggestion that among one's colleagues there is a zombie. Only test subjects, but not researchers, could possibly be living robots. Doubts as to the truth of this last statement would immediately be rejected as cheap polemics.

Organized scientific research is living proof of the supra-phenomenal power that holds the cosmos of monads together; its strength is a kind of magic. Science dances to the tune of attention. For it is not just awe and curiosity that make a scientist. Rather, it is the awe we hope to arouse in other people, the interest we hope to channel to ourselves. It is not the prospect of wealth that is central to the decision to take up research as a profession. If it is income that motivates this choice, then it is income in the form of attention. Indeed, it is a point of honor among researchers to put reputation before money. Reputation is the consolidated income whose currency is the attention of colleagues.

While God's attention may perhaps not accompany the researcher's quest for truth, his immersion in the attention of peers will give him a sense of participating in the divine. The attention of peers is the still point around which everything revolves. The prospect of earning it justifies any effort. It is the highest good on earth, the object of daily struggle in the research community. Pursuit of truth is by no means enough. One must publish. Only he who publishes will stand out; only he who publishes will have a successful career. Publication does not just mean informing one's colleagues. No, it is a way of capturing their attention. It is not enough simply to publish. One must publish in prestigious journals, not only to be read, but to participate in the reputation of those who originally established that journal's high standing.

Research is poorly understood if one assumes that it is nothing but the organized search for truth. If only truth were at stake, why the squabbling about authorship that notoriously accompanies debates on new ideas and discoveries? Why the race to publish first? It is unrealistic to view research simply as organized production of technologically or pedagogically useful knowledge. If that is so, why are there entrenched schools of thought engaged in ferocious ideological fights? Why the frantic attempts to generate spectacular debates? We cannot really understand how science works unless we view research as an organized struggle for attention.

Science demands deep involvement and sacrifice. It requires passionate interest in the matter at hand. Without a deep sensual involvement, intellectual efforts remain feeble. While *eros* fuels the scientist's passion, at least initially, it will not do so by itself and it will not do so forever. Something else must also be present: the dream that other people will be impressed. A person's greatest achievement will remain insignificant unless it is made public and earns other people's attention. Success achieved in private can also be a source of elation, but not for long. If no outside admiration is added, the initial elation will soon subside. The respect of his peers for some minor achievement may be enough to brighten the researcher's routine toils. But a little admiration would certainly add to his pleasure. As I am devoted to my subject, I would like the reaction of others also to be heartfelt. Their souls should be stirred; their enthusiasm, and their consternation, should be equally contagious. My achievements should be on everyone's lips.

*On the economic rationality of scientific research*

Science is not so far removed from the soul as its theories and its philosophy would seem to suggest. Science is also concerned with matters that move the soul. Who does not dream of winning the admiration of the astonished crowd? Who cannot understand the ambition nourished by such dreams? Who has never envied a more successful

colleague who, we believe, is not really better than ourselves? Who will not sympathize with the bitterness generated by the persistent injustice with which the world of experts distributes its favors? All these emotionally stirring questions are closely connected with the business of research. Research is not carried on in an atmosphere that is value-free. On the contrary, questions of value are openly and persistently debated. In these debates, every possible means is used in the fight for attention: mere truth, mere pertinence, mere relevance are by no means all there is. Razzmitazz and pizzaz play a part not to be underestimated. Propaganda and politics have their place, as well as intrigues and skulduggery. It looks as if researchers are, despite themselves and their overt beliefs, demonstrating the importance of the soul.

Philosophy of science closes its eyes to this side of science; it excludes it from its discussions. If it did not, science's claim to objectivity and rationality would be in jeopardy. Philosophy of science has always tried to isolate subjective and political influences and to prove their irrelevance. For this purpose, it distinguishes between a context of discovery and context of justification. Human traits are allocated to the context of discovery. In the context of justification, rationality and objectivity are ensured by Popper's "logic of scientific research." What the context of discovery produces is sorted and judged according to the strictest criteria in the context of justification.

The justification context establishes accounts for the scientific nature of science. There may be chaotic or even irrational influences at work in the context of discovery: those will not do any harm because they just deliver the raw material. In that context, sales strategies and political tactics may well play their part. As long as it is the justification context alone that is decisive for the validity of theories, hygiene in the context of discovery is not salient.

The struggle for attention could be neutralized completely, were the dividing line between context of discovery and context of justification absolutely clear-cut. However, at the latest least since Thomas Kuhn's book on the structure of scientific revolutions, the number is increasing of those who doubt that such a sharp distinction is possible.

They argue that those contexts are not perfectly separated in practice and that one cannot distinguish them clearly from each other, even in analytical terms, either. Some of these critics have gone so far as to suggest that science's claim to objectivity, or even to rationality, should be relativized. On the other hand, particularly among those engaged in practical research, we do not see much inclination to doubt these ideals. The interpretation of the fuzzy demarcation line remains open. Could we not, therefore, turn tables and question whether the struggle for attention really is detrimental to the rationality of science? Is it plausible to assume that the same scientists, who proceed in such an utterly rational manner when examining suggested theories, will suddenly relinquish all rationality as soon as a desired reward is at stake? Are we, perhaps, dealing with two different kinds of rationality?

What counts in the examination of theories is absence of contradictions, adequacy to fact, reproducibility, range, simplicity, productiveness. In contrast, what is prized in the acquisition of attention is wit, entertainment value, fashionable fit, the right social background and good relations with publishers and reviewers. In the first case, observation and measurement are important; in the second, it is the proper handling of other people's interests. In the first case reason constructs a coherent image of the perceived world on the basis of measurement, harmonizing seemingly disparate observations; in the second, reason uses the interests and needs of others for one's own purposes. In the first case, what is required is dexterity in dealing with observed facts, while in the second case what counts is a talent for dealing with other people's feelings and hidden thoughts. Is it under conditions as diverse as these conceivable that rationality leads to uniform behavior?

In fact, the overall rationality of scientific progress cannot depend only on a "logic of scientific research." The reason is that this logic says nothing about the utilization of scarce resources. It gives the impression that research does not cost anything. However, both the creative development and the critical examination of scientific theories are expensive. They are not only expensive in terms of money. Money may be important, but the resource which is absolutely central in research is one's fellow-scientists' attention. Since scientists cannot be replaced by robots, what is required is both

attention and awareness. Humans can only think and act purposefully if they are conscious. The resources of both attention and awareness, however, are limited. Research can only be organized as a rational form of knowledge production if its scarce resources are optimized so as to produce the greatest possible intellectual progress. Less than optimal utilization of investigative attention is wasteful and will detract from progress just as much as any methodical shortcomings.

Who or what, then, ensures the efficient utilization of attention in scientific research? There is no supervisor. Science must organize itself. We know from experience that scientific research is inefficient if it is not free. If it is free, only the researchers' motives will count. Those come in two forms: duty and pleasure. Is it a sense of duty that ensures the efficient allocation of attention in research? There is no doubt that duty plays a role. Research is a field in which a professional code of honor has its place. But a sense of duty has the disadvantage that it is not very inspiring. A sense of duty inspires only routine performance; pleasure, on the other hand, inspires ingenuity. What kind of pleasure are scientists seeking? The positive attention of their peers. Duty cannot win in the battle against this kind of pleasure. Whenever the two conflict, pleasure will always win.

Does this mean that efficiency in the use of investigative attention can only be expected to the extent permitted by the desire to attract other persons' attention? If we are realistic, we should expect nothing else. Is science thus condemned to embrace irrationality? It would be, if our desire for another's attention prevented us from putting our own attention at the service of collective scientific progress. But why should our desire for attention divert us from the collective purpose? The mechanism for distributing attention among researchers is a market. Individuals or groups of researchers in a discipline have two roles: they compete with each other and they are each other's suppliers, suppliers whose products enter into a competition for the attention of those who will test their worth. Colleagues perform this task in the interest of their own production. After all, it does not make sense to make discoveries twice or to develop available knowledge again on one's own. Therefore, in science it pays to pay attention. But the attention one pays to suppliers can be credited to their account as

income. To maximize this income, the suppliers of suggestions must attract the interest of their peers above all. Their need for this interest gives bluffing and hard selling only limited elbow room. We may succeed once in a while in impressing critical colleagues by grandiose behavior, but the game is not over after the first round. Somebody who bites off more than he can chew will be penalized in the following rounds. Repetition of offences will lead to the most severe punishment there is: not to be taken seriously. For researchers not to be taken seriously is to be ruined.

The market of ideas is not based on perfect but on effective competition. The recipients of suggestions pay attention not by agreement or according to some rule, but freely, in search of their own advantage. Thus it is not the pleasure of spending or granting a favor, not even simple curiosity, that determines the distribution of attention. The social distribution of attention is guided by the individuals' interest in their own success. Individual success is measured in attention earned. This means it is in the individual's interest to produce what serves the interest of his colleagues. The desire for attention places strict limits on anyone's whims. A scientist who wants to be successful must organize his production so as to enhance the productivity of others. If the struggle for attention makes it my interest to employ my own attention so as to benefit my competitors, then the market fulfils the decisive and necessary condition for collective rationality. What is still missing is the sufficient condition that overall competition operates in the interest of intellectual progress.

If the struggle for attention makes individual research interests serve the collective interest in intellectual progress, why is there a miasma of irrationality settling over the struggle for attention? Why are there appeals to authority to decide the winners of exhibition bouts? Why the commotion and the race to make one's fortune as quickly as possible? The answer is simple: in order not to miss the fleeting chance of being noticed. Fungible attention is scarce. It does not further a recipient's career to go overboard in surveying the available literature or examining the suggestions made by others. It does not make sense to take note of everything available in one's field. There is simply too much to do; no one can follow up a topic to the bitter end. We must be very selective if we want to have some time left for original research. Thus, unless we

stick to an extremely narrow topic, we are condemned to a certain superficiality when acknowledging the work of others, a superficiality that gives the supply side a chance to make use of the sales strategies and advertising commonly employed in markets. Since the recipients' attention so limited, it pays for the producers to employ elaborate strategies to stand out or push ahead in the line.

The significance of popularity becomes even more apparent when we consider the correspondence between individual efforts to win recognition and collective efforts to further intellectual progress. The necessary condition for such correspondence is that competition among individual researchers forms part of the wider competition among disciplines, and that in this competition among the disciplines there it is also the struggle for attention that counts. Interdisciplinary competition is in fact very effective. The different disciplines are linked by relationships of competition and mutual supply. Like individual researchers, they fight for reputation and gain it by producing something which the other disciplines find useful. On this reputation hangs the ability of a discipline to attract young talents and secure funds. Further, since scientific research is not an isolated activity, but is embedded in the struggle for attention permeating society as a whole, it is very important for a discipline in its competition with others to attract attention outside expert circles and to achieve wider publicity. To a certain extent it is even science's duty to maintain public relations and ensure adequate media coverage. A discipline's conditions of production will deteriorate if it does not manage to sell itself well to the general public.

The heroes in any discipline are those colleagues who succeed best in mobilizing outside attention. As we know, they are often not at the top in their disciplines, but we would be confusing the exception with the rule if we were to conclude that competition for attention is ruled by irrationality. Imperfections in the market of ideas are very similar to other common human imperfections. The market does not reinforce those imperfections to the extent that individuals are unable to see their aims reflected in collective results. Indeed, the fact that the market of ideas functions at all is a prime indication that scientific research can be viewed as rational production of knowledge.



Competition for attention is what harnesses individual interests to the goal of collective knowledge production.

To summarize: Seen against the backdrop of the relationship between individual and collective rationality, the struggle for attention appears in a new light. It no longer seems to be a necessary evil undermining objectivity, but is instead a necessary condition for rational self-organized division of scientific labor. The key organizational problem in research is the efficient utilization of the total attention available for this purpose in society as a whole. To implement this organizational aim, the rules ordinarily safeguarding the rationality of knowledge production are insufficient. There must also be incentives to place what is attractive to the individual at the service of collective scientific progress. This system of incentives is gratification by reputation. Reputation constitutes the consolidated income of peer attention. To achieve it, although a personal achievement need not be uncontested, there must be a more or less unanimous agreement that it is worthy of note. In order to consolidate this income it is not sufficient to impress one's peers just once. Reputation is earned for achievements that become the accepted basis of work for the entire discipline.

Gratification by reputation is the necessary complement to the logic of scientific discovery. But that is not all. It is also an incentive in its own right. It represents a kind of reward not offered by any of the usual systems of gratification. What is special about reputation is that we are not just noticed, but that we play a role in the consciousness of others. We do not try to gain the attention of our peers only to become the subject of data processing by other nervous systems. We try to gain attention in order to play a role in the consciousness of those we consider as most worthy of attention themselves. The tremendous and unequalled fascination of this game is that we actually get the impression that we have been welcomed into other worlds.

Philosophy of science will continue to misunderstand the collective success of the social system known as science if it continues to disregard the motivating power of income in the form of attention. The success of science as seen in the attention it receives and in its general cultural influence is by no means based only on the provision of

technologically or pedagogically useful knowledge. It rests also – no, it rests basically – on its ability to attract talent and on its power to motivate brilliant achievements. This attractiveness and motivating power presuppose sufficiently potent gratification systems. Mere invocation of abstract enthusiasm is not enough. The gratifications normally used as incentives are money and power. Society pays dearly for both, as both are connected with exploitation and dominance. If science disposed of nothing but money and privileges in order to attract talent, the costs of research on its present scale would be prohibitive.

The stroke of luck that gratification by reputation represents for organized research is not limited to the fact that playing a role in another consciousness is so immensely attractive. The attention that researchers pay to each other is not only a motivating force, but also a productive force. Paying attention turns into income creation when it is brought into play in the reception and testing the work of one's colleagues. This coupling of functions is a most ingenious trick. It means that attention need not be diverted from productive purposes for the purpose of motivation. Rather, by turning peer review to productive purposes, the incomes of colleagues are siphoned off automatically, without any additional effort. The ingenuity of this dual, productive and remunerative, utilization of attention surpasses anything that management and business administration experts have ever invented.