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Erwin Schrodinger
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NATURE AND THE GREEKS

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*Shearman Lectures,
delivered at University College, London
on 24, 26, 28, and 31 May 1948*

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*To my friend
A. B. CLERY
in gratitude for his
invaluable aid*

CHAPTER I
THE MOTIVES FOR RETURNING
TO ANCIENT THOUGHT

When, early in 1948, I set out to deliver a course of public lectures on the subject dealt with here, I still felt the urgent need of prefacing them with ample explanations and excuses. What I was expounding then and there (to wit, at University College, Dublin) has come to form a part of the little book before you. Some comment from the standpoint of modern science was added, and a brief exposition of what I deem to be the peculiar fundamental features of the present-day scientific world-picture. To prove that these features are historically produced (as against logically necessitated), by tracing them back to the earliest stage of Western philosophic thought, was my real objective in enlarging on the latter. Yet, as I said, I did feel a little uneasy, particularly since those lectures arose from my official duty as a professor of theoretical physics. There was need to explain (though I was myself not so thoroughly convinced of it) that in passing the time with narratives about ancient Greek thinkers and with comments on their views I was *not* just following a recently acquired hobby of mine; that it did not mean, from the professional point of view, a waste of time, which ought to be relegated to the hours of leisure; that it was justified by the hope of some gain in understanding modern science and thus *inter alia* also modern physics.

A few months later, in May, when speaking on the same topic at University College, London (Shearman Lectures, 1948), I already felt much more self-assured. While I had initially found myself supported mainly by such eminent scholars of antiquity as Theodor Gomperz, John Burnet, Cyril Bailey, Benjamin Farrington—some of whose pregnant remarks will later be quoted—I very soon became aware that it was probably neither haphazard nor personal predilection which made me plunge into the history of thought some twenty centuries deeper than other scientists had been induced to sound, who responded to the example and the exhortation of Ernst Mach. Far from following an odd impulse of my own, I had been swept along unwittingly, as happens so often, by a trend of thought rooted somehow in the intellectual situation of our time. Indeed, within the short period of one or two years several books had been published, whose authors were not classical scholars but were primarily interested in the scientific and philosophic thought of today; yet they had devoted a very substantial part of the scholarly labour embodied in their books to expounding and scrutinizing the earliest roots of modern thought in ancient writings. There is the posthumous *Growth of Physical Science* by the late Sir James Jeans, eminent astronomer and physicist, widely known to the public by his brilliant and successful popularizations. There is the marvellous *History of Western Philosophy* by Bertrand Russell, on whose manifold merits I need not and cannot enlarge here; I only wish to recall that Bertrand Russell entered his brilliant

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career as the philosopher of modern mathematics and mathematical logic. About one third of each of these volumes is concerned with antiquity. A handsome volume of a similar scope, entitled *The Birth of Science* (*Die Geburt der Wissenschaft*) was sent to me at nearly the same time from Innsbruck by the author, Anton von Mörl, who is neither a scholar of antiquity, nor of science, nor of philosophy; he had the misfortune at the time when Hitler marched into Austria to be the Chief of Police (*Sicherheitsdirector*) of Tirol, a crime for which he had to suffer many years in a concentration camp; he luckily survived the ordeal.

Now if I am right in calling this a general trend of our time, the questions naturally arise: how did it originate, what were its causes, and what does it really mean? Such questions can hardly ever be answered exhaustively even when the trend of thought that we consider lies far enough back in history for us to have gained a fair survey of the total human situation of the time. In dealing with a quite recent development one can at best hope to point out one or the other of the contributory facts or features. In the present case there are, I believe, two circumstances that may serve as a partial explanation of the strongly retrospective tendency among those concerned with the history of ideas: *one* refers to the intellectual and emotional phase mankind in general has entered in our days, the *other* is the inordinately critical situation in which nearly all the fundamental sciences find themselves ever more disconcertingly enveloped (as against their highly flourishing offspring like engineering, practical

—including nuclear—chemistry, medical and surgical art and technique). Let me briefly explain these two points, beginning with the first.

As Bertrand Russell has recently¹ pointed out with particular clarity, the growing antagonism between religion and science did not arise from accidental circumstances, nor is it, generally speaking, caused by ill will on either side. A considerable amount of mutual distrust is, alas, natural and understandable. One of the aims, if not perhaps the main task, of religious movements has always been to round off the ever unaccomplished understanding of the unsatisfactory and bewildering situation in which man finds himself in the world; to *close* the disconcerting ‘openness’ of the outlook gained from experience alone, in order to raise his confidence in life and strengthen his natural benevolence and sympathy towards his fellow creatures—innate properties, so I believe, but easily overpowered by personal mishaps and the pangs of misery. Now, in order to satisfy the ordinary, unlearned man, this rounding-off of the fragmentary and incoherent world picture has to furnish *inter alia* an explanation of all those traits of the material world that are either really not yet understood at the time or not in a way the ordinary unlearned man can grasp. This need is seldom overlooked for the simple reason that, as a rule, it is shared by the person or persons who, by their eminent characters, their sociable inclination, and their deeper insight into human affairs, have the power to prevail on the masses and to fill them with enthusiasm for their

¹ *Hist. West. Phil.* p. 559.

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enlightened moral teaching. It so happens that such persons, as regards their upbringing and learning and apart from these extraordinary qualities, have usually themselves been quite ordinary men. Their views about the material universe would thus be as precarious, actually much the same, as those of their listeners. Anyhow, they would consider the spreading of the latest news about it irrelevant for their purpose, even if they knew them.

At first this mattered little or nothing. But in the course of the centuries, particularly after the rebirth of science in the seventeenth century, it came to matter a lot. According as, on the one hand, the teachings of religion were codified and petrified and, on the other hand, science came to transform—not to say disfigure—the life of the day beyond recognition and thereby to intrude into the mind of everyman, the mutual distrust between religion and science was bound to grow up. It did not spring from those well-known irrelevant details from which it ostensibly issued, such as whether the earth is in motion or at rest, or whether or not man is a late descendant of the animal kingdom; such bones of contention can be overcome, and to a large extent have been overcome. The misgiving is much more deeply rooted. By explaining more and more about the material structure of the world, and about how our environment and our bodily selves had, by natural causes, reached the state in which we find them, moreover by giving this knowledge away to everybody who was interested, the scientific outlook, so it was feared, stealthily wrested more and more from the hands of

the Godhead, heading thus for a *self-contained* world to which God was in danger of becoming a gratuitous embellishment. It would hardly do justice to those who genuinely harboured this fear, if we declared it utterly unfounded. Socially and morally dangerous misgivings may spring, and occasionally have sprung—not, of course, from people knowing too much—but from people believing that they know a good deal more than they do.

Equally justified is, however, an apprehension which is, so to say, complementary and which has haunted science from the very time it came into existence. Science has to be careful of incompetent interference from the other side, particularly in scientific disguise, recalling Mephisto, who, in the borrowed robe of the Doctor, foists his irreverent jokes upon the ingenuous Scholar. What I mean is this. In an honest search for knowledge you quite often have to abide by ignorance for an indefinite period. Instead of filling a gap by guesswork, genuine science prefers to put up with it; and this, not so much from conscientious scruples about telling lies, as from the consideration that, however irksome the gap may be, its obliteration by a fake removes the urge to seek after a tenable answer. So efficiently may attention be diverted that the answer is missed even when, by good luck, it comes close at hand. The steadfastness in standing up to a *non liquet*, nay in appreciating it as a stimulus and a signpost to further quest, is a natural and indispensable disposition in the mind of a scientist. This in itself is apt to set him at variance with the religious aim of closing the picture, unless each of the two antagonistic attitudes,

both legitimate for their respective purposes, is applied with prudence.

Such gaps easily evoke the impression of being undefended weak spots. They are at times seized upon by persons whom they please, not as an incentive for further quest, but as an antidote against their fear that science might, by 'explaining everything', deprive the world of its metaphysical interest. A new hypothesis is put up, as everybody is, of course, entitled to do in such a case. At first sight it seems firmly anchored in obvious facts; one only wonders why these facts or the ease with which the proposed explanation follows from them have escaped everybody else. But this in itself is no objection, for it is precisely the situation we very often have to face in the case of genuine discoveries. However, on closer inspection the enterprise betrays its character (in the cases I have in mind) by the fact that, while apparently tendering an acceptable explanation within a fairly wide range of inquiry, it is at variance with generally established principles of sound science, which it either pretends to overlook or airily reduces with regard to their generality; to believe in the latter, so we are told, was just the prejudice that was in the way of a correct interpretation of the phenomena in question. But the creative vigour of a general principle depends precisely on its generality. By losing ground it loses all its strength and can no longer serve as a reliable guide, because in every single instance of application its competence may be challenged. To clinch the suspicion that this dethronement was not an accidental by-product of the whole

enterprise, but its sinister goal, the territory from which previous scientific attainment is invited to retire is with admirable dexterity claimed as a playground of some religious ideology that cannot really use it profitably, because its true domain is far beyond anything in reach of scientific explanation.

A well-known instance of such intrusion is the recurring attempt to reintroduce *finality* into science, allegedly because the reiterated crises of *causality* prove it to be incompetent single-handed, actually because it is considered *infra dig.* of God Almighty to create a world which He disallowed Himself to tamper with ever after. In this case the weak spots seized upon are obvious. Neither in the theory of evolution nor in the mind-matter problem has science been able to adumbrate the causal linkage satisfactorily even to its most ardent disciples. And so *vis viva*, *élan vital*, entelechy, wholeness, directed mutations, quantum mechanics of free will, etc. stepped in. As a curiosity, let me mention a neat volume¹ printed on much better paper and in much more handsome form than British authors were used to at that time. After a sound and scholarly report on modern physics, the author happily embarks on the teleology, the purposiveness, of the interior of the atom and interprets in this manner all its activities, the movements of the electrons, the emission and absorption of radiation, etc.,

And hopes to please by this peculiar whim
 The God who fashioned it and gave it him.²

¹ Zeno Bucher, *Die Innenwelt der Atome* (Lucerne: Josef Stocker, 1946).

² From Kenneth Hare, *The Puritan*.