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The Body of Christ and the Origin of Modernity

More than ever before, Catholic theology at this time [AD 1190–1250] was a statement about light. In order to combat the temptations offered by the Albigensian heresy, the best of the theologians harked back to the system of hierarchies described by Dionysius the Areopagite, and sought to shore up that monument with sturdier reasoning and enrich it with the progress that had been made in physics. Robert Grosseteste, who founded the first schools in Oxford, the nucleus of the future university, read Greek fluently; he was familiar with Ptolemy and the new astronomy and with the Arabs' scientific commentaries on Aristotle's *Treatise on the Heavens*. In Grosseteste's philosophy, God was still light, and the universe was a luminous sphere that radiated outward from a central source into the three dimensions of space. All of human knowledge stemmed from a spiritual irradiance of uncreated light. Were it not that sin makes the body opaque, the soul would be able to perceive the blaze of divine love directly. It was in the body of Christ, both God and man, that the corporeal universe and the spiritual universe reverted to their original oneness. Hence Jesus was designated—and, along with him, each of the cathedrals, as so many symbols of Jesus—as the center from which all things proceeded and received their light: the Trinity, the Word incarnate, the Church, mankind in general, and all of creation.

Duby 1981: 147

I

THE PROBLEM OF THE ORIGIN
OF MODERNITY

As is well known, after its first thousand years Christendom came to accept the great schism between the western and the eastern, the Latin and the Greek, churches as permanent (AD 1054), and their mutual excommunications were not retracted until 1965. The chronology of the other great break in the unity of Christendom, i.e. the division marked by the Reformation and the counter-Reformation, is perhaps best encapsulated by the Council of Trent (1545–63). This was probably the longest council ever to be convened in Christianity and it produced the modern Roman Catholic church and its doctrine, on the one hand, at the very time when the Protestant churches were being founded by the reformers, Luther, Zwingli and Calvin, on the other hand. If the controversies of the first period were concerned with (a) the relations of Jesus Christ to God and to man, I hope to show that the controversies of the new modern schism were concerned with (b) the relations of Jesus Christ to man and to nature. So opened in effect in the mid-sixteenth century the modern chapter of man and nature as well as of natural science, owing as much (or more) to the Reformation as it did to the Renaissance.

The thesis is that the manifest focus of the Reformation and the counter-Reformation was upon the question of the liturgy, i.e. the mode of presence of divinity in Christian ritual, as much as upon questions of faith and the church hierarchy. The chief argument took place between the Pope and Luther and Zwingli as the three imagined parties. Their respective positions may be called transubstantiation, consubstantiation and non-substantiation, but they all implicitly made certain modern assumptions such as the mutual alienation of the truth (*veritas*) and the reality (*realitas*) or the spirit and the form. Altogether the debate marked the watershed between the medieval and the modern periods of Europe as representing two distinct world-views and life-worlds, whatever their respective varieties. It was given to Zwingli, if we single him out, to expressly formulate the new system of interrelations between God, man and nature, which

in turn produced the new man and the new secular philosophy, the sciences of man and the sciences of nature.

In other words, what we call modernism or modernity as a faith, a regime and a system in the wide sense first arose in Europe, as it would arise anywhere, over the question of the place of God and the sacred axiology in the world-view and the life-world of man. Modern positivist dualism first attacked and successfully demolished the medieval Christian synthesis, transcendentalist and immanentist, in the sphere of religion, i.e. in relation to divinity or spirit and its symbols, and only then went on to unfold on its own the new relations, categories and attitudes of modern life and thought. The shortest way I know to define and explain the new regime or structure as a whole is to say that it rested on two fundamental presuppositions: (a) the dissociation and the autonomy of fact and value in the field of knowledge; and (b) the dissociation and the autonomy of lexical truth and applied praxis, or theory and technique or consciousness and conscience or belief and conduct, in the field of life. The interrelation of the fields of knowledge and human life, truth and method, within a still larger whole consisting of, say, God, man and nature, it left as an entirely open question on which its position was, as it were, perfectly agnostic. The implicit theory of modern practice and the practice of modern theory together built and unfolded a powerful new regime of science and culture, philosophy, politics, economics and ethics, which has lasted to this day.

Up to and partly including the period of the Renaissance, it seems that any European could pursue knowledge of the true, the good, the beautiful and the useful conjointly as *scientia*, as did Leonardo da Vinci (1452–1519) for instance, while relegating to the outer darkness, to witchcraft and the occult, knowledge of the false, the evil, the ugly and the useless. The first pursuit was holy and the second unholy, the first superordinate and the second subordinate, almost by definition. After the great schism of the Reformation and the counter-Reformation in the mid-sixteenth century, however, the order of priorities and distinctions between and within the two sets of terms was completely reversed. The student was now asked to determine first and foremost whether the object of knowledge fell within the competence of the mathematico-experimental sciences, the

moral and political sciences or the arts, whether useful or ornamental. Since each one of the three great branches of knowledge and their corresponding practical arts purported to deal with separate and different questions autonomously, the determination of truth versus falsity or good versus bad or beautiful versus ugly or useful versus useless could take place only afterwards and secondarily. It followed logically that each one of these latter determinations in the arts and sciences, pure and applied, was to be done somehow independently of the others.

Now I think that the seemingly purely theological debate which took place at Marburg in AD 1529 over the nature of the Christian ritual sacraments between Luther and Zwingli, both of them apparently Protestant reformers, marked the final *inward* division between the old and the new forms in the history of European civilization. At the same time, the almost simultaneous *external* manifestation of modern western consciousness as well as conscience was marked by the so-called Age of Discovery when the Christian west cut itself off from the rest of the world in its own eyes and so was able to set out to discover, subordinate and conquer or to destroy the rest without fear of God. The relation between the outward manifestation and the inward manifestation of the new modern age was, as we shall see, precisely the kind of question that the modernist philosophy or regime was from the beginning determined not to face and solve.

It is well known how the term Protestant was first applied to those who favoured the cause of Luther and who protested against the intolerant majority decision at the second Diet of Speyer (1529) which revoked the earlier decision of the first Diet of Speyer allowing the church reformers a say in limited cases (1526). The Protestants then were all those who severed their connection with the Church of Rome at the time of the Reformation; and it is said that the essence of Protestantism was the acceptance by the individual Christian of his or her direct responsibility to God and to oneself rather than to the church, thus placing the local congregation of souls above the hierarchy. But this was not the whole story or its quintessence in my opinion. We should try and reformulate first the key question that drove the old Europe to the new schism, and the answers

to which subsequently defined the Reformation and the counter-Reformation alike.

II

THE MARBURG COLLOQUY (1529)

In that historic and crucial year of 1529 the Lutheran prince, Philip of Hesse, had summoned both Luther and Zwingli to meet at his castle at Marburg in order to work out a Protestant consensus which he would back, but their public debate was wrecked by a fundamental disagreement over the truth and the reality of *the symbol* in relation to Christianity. The fourteen articles that were drawn up at Marburg recorded that the two parties had come to an agreement on every point except one, the mode of presence of Christ in their rituals. That is to say, the chief point of contention was: just how precisely had he lived and died and yet left for the faithful, through the ministry of his priests and in virtue of the true words said and repeated, his own real flesh and blood to be the meat and drink of Christians, to be fed upon under the appearance of a little bread and wine for the showing of the Lord's death until he come again? The Marburg colloquy foundered on this issue and it ended more or less with these words:

We have not at this time come to an agreement as to whether the true body and blood of Christ are corporeally in the bread and wine.

I think that the key to the whole story of the new schism lies in discovering the original significance of these few words and specially the duality that they presumed (or newly established?) to exist between a spiritual or mystical presence and a corporeal or material presence. By stating this issue and forcing it into the terms of dualism, or perhaps more properly of double monism, Zwingli had discovered or invented the modern conception of time in which every event was either spiritual and mental or corporeal and material, but no event was or could be both at once, as in the Christian world-view and life-world of combined transcendentalism and immanentism. It was just as if Christianity, the religion of the saviour as the one and only mediator, the unity in the duality, had simply relapsed into a

kind of Manichaeism, the religion of all duality without any mediation.

Firstly, I should say that Luther (1483–1546) was himself far from being the architect of modernity as some people would like to have him, but represented fairly closely the traditional interpretation of the Latin church. His famous earlier ninety-five theses already nailed to the door of the church at Wittenberg in 1517 were not articles of theological dissent but rather moral complaints against church abuses. Indeed, at Marburg Luther argued essentially that the sacred rituals of Christianity embodied the real and true point of intersection or ‘consubstantiation’ of divinity or spirit and the profane world and were effective in that capacity. Symbol, myth and ritual genuinely called forth or reconstituted *the real presence* of Jesus Christ’s true body and blood in the Eucharist or the Lord’s supper, the supreme Christian ritual. The means of communion with the risen Lord and the objective guarantee of the forgiveness of sins was the real presence of his body and blood, which were present not only to the eye of faith but truly ‘in, with and under’ the bread and the wine and really present even for the unbeliever.

Secondly, I would even go so far as to accept the modern view, although it seems to be a post-Reformation one and a reformulation, that Luther’s doctrine of consubstantiation, i.e. the real substantial presence of the body and the blood together and along with the bread and the wine in the Eucharist, was half-way removed from the supposedly traditional doctrine of transubstantiation, i.e. the conversion of the whole substance of the bread and the wine into Christ’s body and blood respectively, leaving only the appearance or ‘accidents’. But I hold that the radical rupture in the terms of the debate was due chiefly to Zwingli, the so-called third man of the Reformation, rather than to Luther or Calvin, and that the Council of Trent in a way recognized the fact. Research should take interest, therefore, not so much in the question of the Roman Catholic versus the Protestant as in the difference among varieties of Catholicism and of Protestantism so as to explain the decisive break of Zwingli in 1529 with Luther *and* the Pope, who turned out to have so much in common from the new modern point of view.

Thirdly, Luther had consistently also held like the pre-Reformation churches that the sacraments were the individual’s

indispensable means of salvation along with his or her Christian faith and conscience. Faith, obtained through the grace of God, ritual and good works were together parts of a single religion and not three alternative possibilities of salvation as they were to become in Christianity later on.

From the point of view that was subsequently adopted by the Council of Trent (1545–63), which had apparently met to define and provide the Pope’s answer to Luther, there were in retrospect two distinct rituals that were conjoined in the pre-Reformation churches. What was called the Eucharist had been in the medieval period at one and the same time both (a) the supreme sacrament of the Eucharist regarded as sharing in the Lord’s last supper, and (b) the Mass regarded as being a true sacrifice participating in the original sacrifice of Christ on the cross. On the face of it, Luther himself had only wanted to restore ‘the word’ to its rightful place in the sacraments and so to remove the (priestly) ‘superfluous miracles’; his avowed reform was aimed to preserve the Eucharist and its invisible saving grace as the supreme sacrament. Zwingli had, on the other hand, advisedly set out to attack the sacrificial ritual of the Mass. This difference of emphasis, the defence of (a) and the attack on (b), can be suggested to explain in some sense their difference of opinion, but I believe that the consequences of the debate itself were truly momentous for the world.

Zwingli (1484–1531), the reformer of Switzerland, had never enjoyed in his life the kind of secular support which lined up behind Luther in Germany, and Zwingli left behind no church in his name. His importance is dismissed very lightly by the sociologist Weber and even by the historian Troeltsch. Zwingli was to start with the enlightened child of the humanist Renaissance of Italy, and he was invited to the Swiss principality of Zurich in 1519. He there campaigned against the ritual of the Mass until he got the council of Zurich to abolish it in 1525. To properly assess this action alone it is necessary to recall that to medieval Europeans the Mass had been the chief mystery of the church, regarded as a holy drama both rehearsing and exhibiting again and again the story of the Lord’s passion ‘till he come’. Jesus Christ had offered himself on the historical cross and he again offered himself daily in the Mass before the people’s very eyes and in their lives. Already in 1264 Aquinas had

explained in the presence of the Pope that the sacrament of faith affected the body as well as the soul: it restored health and vigour to the sick and the weak as well as giving grace and virtue; it was the consolation of the dead as well as the completion of Christ's mystical body, the church. But Zwingli was out to overthrow all such 'priestly miracles' and would have nothing to do with any thought or practice of a repetition, renewal, participation in or continuation of the sacrifice on the cross.

Zwingli constantly stressed rather the social side of Christianity, i.e. the relation of the sacraments to the community at the present time. The Eucharist was for him only the outward symbol, so to say, of the inward union and communion of all believers in Christ, a kind of renewed sign and pledge of common allegiance to Christ and membership in him. As against the medieval ritual sacrifice of the Mass, Zwingli went ahead and set the Eucharist in the form of the Lord's supper regarded simply as a commemoration, a memorial or a remembrance of Christ's sacrifice offered once and for all. The primary reference of the reformed Eucharist was to be the physical and historical death of Christ (the crucifixion) rather than the metaphysical event of the risen Christ glorified (the resurrection), and certainly not both at once. The bread and the wine were merely symbols and figurative signs, certainly not symptoms, of the broken body and the shed blood of Christ, at most only the metaphorical seals of this purely spiritual union, the life of Christ in us and ours in him, which was renewed by God.

So in 1527 when Luther published his tract to the effect 'That the words of Christ, *This is my body*, still stand firm', Zwingli at once replied with his tract 'That the words of Christ, *This is my body*, would eternally keep their ancient and sole meaning; and Martin Luther with his latest book has not made good his own and the Pope's interpretation.' There were other similar exchanges between the two men which are on the record of history. From the beginning of his career right up to the end Zwingli insisted that in the utterance 'This is my body' (*Hoc est corpus meum*) the existential word 'is' (*est*) was to be understood, not in a real, literal and corporeal sense, but only in a symbolical, historical or social sense (*significat, symbolum est or figura est*). In effect he insisted that in this sinful and fallen world the two opposed senses were to be regarded as mutually

exclusive, separate and different. The literal reality (fact) was to be regarded as being only of the body and this world, while the spiritual truth (value) was to be regarded as being only of the soul or the mind. Dualism or double monism was to be permanently fixed in the world-view and the life-world of the modern age, which was thereby ushered in.

It had been all in vain for the mystic Eckhart, who incidentally belonged to the same Dominican order as Aquinas, to have argued in his defence some two centuries earlier that it was evident to him that the holy scriptures had to be explained and understood 'parabolically', as he put it, but that it was not any the less true on that account that they must also be explained and understood by the Christian literally and historically.

To sum up the terms of the debate, we may say that Zwingli completely denied at Marburg against Luther and the Pope the efficacy of traditional Christian rituals. Before the schismatic revolution, the whole visible cosmos was the body of God, more or less, and it might be viewed as such by students of nature. By the new definition, inward spiritual faith alone was Christian and effective in any real and true sense, not the symbol, image, myth, drama and ritual. The spirit spoke only to the spirit, Zwingli said, and the sole aim of the divine service was the preaching of the word of God. Therefore, the ritual of the church should give way to the word in the chapel. The ultimate mystery of Christianity still remained somewhere perhaps between the ideal form of God and the 'priesthood of all believers', i.e. the local congregation of worshippers, but it was now wholly removed and excluded from the individual Christian's world of sensory perception, objective experience and outward existence. For the unregenerate man of modernity who lived in a thoroughly dualist world, there would be no manifestation of God in space and time: 'He is appropriated by faith alone.'

Of course, I do not wish to imply that Luther and Zwingli held nothing in common that went against the Pope and the orthodox Church of Rome. There were other well-known contributions of Zwingli which can be said to be parallel to those of Luther, namely, his view that only the word of the Bible, which he was the first to take as his text and preach directly from in his day under the guidance of the Holy Spirit, possessed spiritual authority over the faithful as against the claims of the

Pope and the medieval church hierarchy, and his active moral attitude to the secular world of work, etc.

III

THE NEW RELIGION AND DUALISM OF MIND AND THE WORLD

I hold that the sum total of Zwingli's revolution was finally (a) to divide the world of spiritual truth and the inner light from the world of apparent reality and outer forms; and (b) to insist that the two spheres of existence and experience, the inner and the outer, never met for man in this as against the next world. The two spheres were to be regarded as separate *and* different until the last judgment of God, since there was no medium left for their interaction, and this would lead to the infinite regression of dualism.

No non-dual Christian unity of the truth and the reality, the spirit and the forms, was ever presently attainable in a sinful world even for a blessed moment. The new Christian would no longer seek to transcend the duality of the spiritual and the temporal through ritual and the church as in medieval Europe, but rather, if at all, through the word in the chapel and work in the world. This work alone would show in this life and world whether a man was predestined to be saved for the other world or not (Calvin). For the Puritans and the dissenters, the Baptists, Independents, Presbyterians and Methodists, the mediation of the church would give way to the mission of the chapel.

For the purity of his modernism and radical anti-ritualism over the question of the Eucharist, Zwingli thus ruined the chances of his political alliance with the Lutherans which Philip of Hesse had wanted in 1529. Later, Zwingli himself ventured into the field against those cantons of Switzerland which had remained faithful to the Church of Rome, and he died a martyr to the cause in the battle of Kappel in 1531.

The sacramental controversy over the real presence had shaken and split into two or more parts what had been, in the words of Thomas Aquinas, the central pillar of the church. What had been, again according to Thomas Aquinas, the greatest miracle that he ever wrought, i.e. the supreme Christian ritual, which

was altogether one and indivisible, subjectively and objectively, so that the Lord was present whole, entire and perfect in every fragment of the symbolic species, was henceforward to be regarded as visible only to the eye of faith and only on Sundays. Zwingli had said clearly, when disputing against Bucer as well as Luther, that what was present in the Eucharist is only by true 'synecdoche', a kind of metaphor (*mens*, in the mind of the believer); and that what he denied is any real 'metonymy': you cannot bite, Zwingli said, the body of Christ between the teeth (*dentibus ter{r}i*).

We may now put it that the reformulated Roman Catholic doctrine of 'transubstantiation' as well as the Lutheran doctrine of 'consubstantiation' both equally presupposed two separate and distinct spheres of spiritual and mystical versus material and corporeal presences. We have attempted to show that this was the new framework of thought presupposed or introduced by Zwingli's argument which might be called by analogy the argument of 'non-substantiation'. The debate at Marburg marked the frontier in Christendom between the medieval and the modern as much as between the Roman Catholic and the Protestant because in theory and practice whichever one of the modern set of three paths you adopted, following the Pope, Luther or Zwingli, the non-dualist modes of combined transcendence and immanence, if they ever existed, had gone for good and all.

The Pope's new doctrine now wholly removed, just like the Protestants to whom it was a response, the pantheistic element from the nature of the world. The Protestants had not only rejected the doctrine of transubstantiation but provoked the Council of Trent to redefine away out of its medieval past what they had rejected, the unity of substance and accident. Either way, whether it was affirmed or rejected, the new ritual of transubstantiation was believed to be a kind of miraculous transference by God's agency between two separate planes and two different times, i.e. from the material and the present to the spiritual and the eternal; it was no longer a normal transaction of God and man in this world.

Firstly, the trinity of spirit, word and sign had finally parted company for man at Marburg in 1529; and myth or ritual, say, was no longer literally *and* symbolically real and true, like a

symptom or a signature. This modern dualist separation has been called the dissociation of faith and sensibility or of faith and knowledge. Several western writers have said that its wide and deep repercussions went far beyond the Protestant reform of the Christian church, and that it helped to produce modern man and the modern world in relation to the new image of God. I think that it is worthwhile to add that Zwingli was the chief architect of the new schism and that Europe and the world followed Zwingli in the event. Zwingli, the reformer of Zurich, was in his system of thought the first philosopher as he was in his life and death the first martyr of the modern world.

Secondly, I do not agree with those who thought—and many still do—that, on the other hand, the real issue of Protestant modernism was the question of authority, and that it lay between Luther and his traditional church superiors in the Roman hierarchy, which is the issue that also came to a head at the second Diet of Speyer in the same year of 1529. It seems that in modern dualist thought one must make the choice and attribute priority either to the idealist struggle for truth (Marburg) or to the material struggle for power (Speyer). But I argue that this is precisely the mode of thought and experience newly introduced by Zwingli, and that the whole issue was and is better interpreted as being one about the power of truth (the ritual) or about the truth of power (the church) or about both at once. I think that the battle of the big battalions, the Pope's and Luther's, decided little in the end, and that the modern European revelation, which irradiated the Roman Catholic and the Protestant alike after the Council of Trent had implicitly adopted the new rules of debate, was vouchsafed whole to Zwingli, the apparently lone figure.

Thirdly, we must also observe here that the crucial thirty-nine articles of the Church of England which defined the Elizabethan church settlement (1562) were themselves Zwinglian or very nearly so on the nature of the supreme sacrament. Although some high-church men may still speak figuratively of the Eucharist as a 'sacrifice', the duly established twenty-eighth article of the Church of England lays down that

The Body of Christ is given, taken and eaten in the Supper *only* after an heavenly and spiritual manner. And the mean(s) whereby the Body of Christ is received and eaten in the Supper is Faith.

Finally, the sovereign as defender of the faith and supreme head of the church also made a declaration to the effect

That if any publick reader in either of Our universities or any head or master of a college or any other person respectively in either of them shall affix any new sense to any article... other than is already established in convocation with Our royal assent; he or they the offenders shall be liable to Our displeasure... and We will see there shall be due execution upon them.

This was said, demanded and commanded of the universities scarcely thirty years after the dissolution of the monasteries (1534–39), which had itself left the world of learning newly exposed to the power of the state in England. All members of the universities of Oxford and Cambridge, which were the only two in England for the three centuries that followed, were thus required for reasons of the state as well as the church to adhere to the thirty-nine articles, among other things. The university test act, which eventually abolished subscription to the articles, etc., as prerequisite to taking a degree, was not passed by Parliament in London until 1871.

The university man (and later woman) of England was in the modern period generally familiar with, even a participant in, the world of Zwingli and the Reformation as much as of Erasmus, say, and the Renaissance. I would say this on the basis of many years of what is called participant-observation of the British university system, even if I were not able to produce all the evidence or go into all the historical details. The sceptic is asked, not to accept this as his or her conclusion, but to consider that, if my general hypothesis of the gift of Zwingli and the new religion seems too wide to be tested, as it well might to some people, then the limited and concrete empirical object of investigation to be borne in mind should be *the modern university* and its new regime. In the nineteenth century Helmholtz, leader of the sciences of nature in Germany, had proudly boasted in his address on academic freedom that the same spirit which overthrew the yoke of the Church of Rome had also reorganized the modern German university. The first modern Protestant university of Europe was established at Marburg itself in 1527, soon to be followed by Koenigsberg (1544) and then Jena (1558). The reopened discussion at Marburg on the mode of presence of divinity in Christian ritual

had reciprocally also implied a new dualist mode of presence for man in the world. This new dualist mode in its turn led to the new conception and organization of human knowledge in the modern European university, e.g. dividing the sciences of nature and the humanities of spirit.

(It is difficult for the outsider without a knowledge of Latin and German to follow the controversies of the Reformation and the counter-Reformation, but I have utilized the introductory articles in English on different aspects of the new schism available in the *Encyclopaedia of religion and ethics*. See specially under the heading, Eucharist, in Hastings 1912: V, 540-70.

I have also consulted the standard English editions of Thomas Aquinas and of Eckhart's articles of defence as selected representatives of the official and the unofficial medieval Christianity respectively. The last two quotations are taken from the current edition of the *Book of common prayer and liturgy*, which was first compiled in 1549 and started to take its present form in 1559.

According to the articles of Eckhart's defence [4: 14], it seems that the matrix of the Eucharist in his interpretation was made up by the elements and the equation, bread : wine :: flesh : blood :: body : soul. Each pair of these oppositions was 'united in being', and all three of them were unified by the authority of Christ [John 6: 56]. This is an example of the non-dualist unity of the spiritual and the corporeal elements in medievalism.

The sociology of Zwingli in English in a strictly professional sense seems to comprise only Birnbaum [1959], who knows his German but unhappily inclines towards the materialist interpretation of history in its most undialectical form.)

IV

SCIENCE UNDER THE MODERN REGIME

The system of the categories, relations and attitudes of life and thought that we call modern western civilization was fully manifested first, not so much in early capitalism and the Renaissance in Italy, but in the sphere of religion during the Reformation at Marburg and the counter-Reformation at Trent,

1529 to 1545. Its dualist logic as a whole then quickly invaded the other fields of European life and thought and restructured the relations between them, e.g. economics and politics, the sciences and the arts. In the beginning, as Durkheim the French sociologist wrote, everything is religious, and I only want to say the same of the European modernity, including its science. According to the method followed here, this is not a matter primarily of assessing the relative weights of causes, factors or features of the European modernity, but of suggesting an hypothesis on the basis of a discourse analysis of civilization as to exactly how the exercise of human free will, if there is any, had its widest, deepest and strongest repercussion or significance and effect in history.

I may somewhat simplify the structure of the modernist regime by saying that its two fundamental axes were the division between fact and value, on the one hand, whether or not value was further bifurcated into the instrumental versus the symbolic; and the division between lexis and praxis, theory and practice, on the other hand. These dividing lines were drawn hard and fast and they marked out the four quarters of modern western civilization to be occupied by the new science, technology, philosophy and politics, economics or ethics. My thesis is that this is the elementary structure of the modern *positivist* regime as a system, which produced the inner organization of modern western science, on the one hand, and its relations with the whole of the European modernity, on the other hand (fig. 2).

The old and/or perennial non-dualist Godly emphasis of truth and method was on the unity of conception that inwardly linked the truth of every part of man's estate with the reality of the whole externally as well as for the subject. The new dualist regime's emphasis was on the autonomy and independence of the separate and different sections, strata or segments of the cosmos, inner and outer, but chiefly outer. Each varied aspect and diverse part was to be comprehended and methodically brought under control separately and independently of the others, piece by piece. God might still exist and be active in the sub-field of the philosophy of religion, of course, but he had died out in three quarters of the European modernity, including its science of nature.

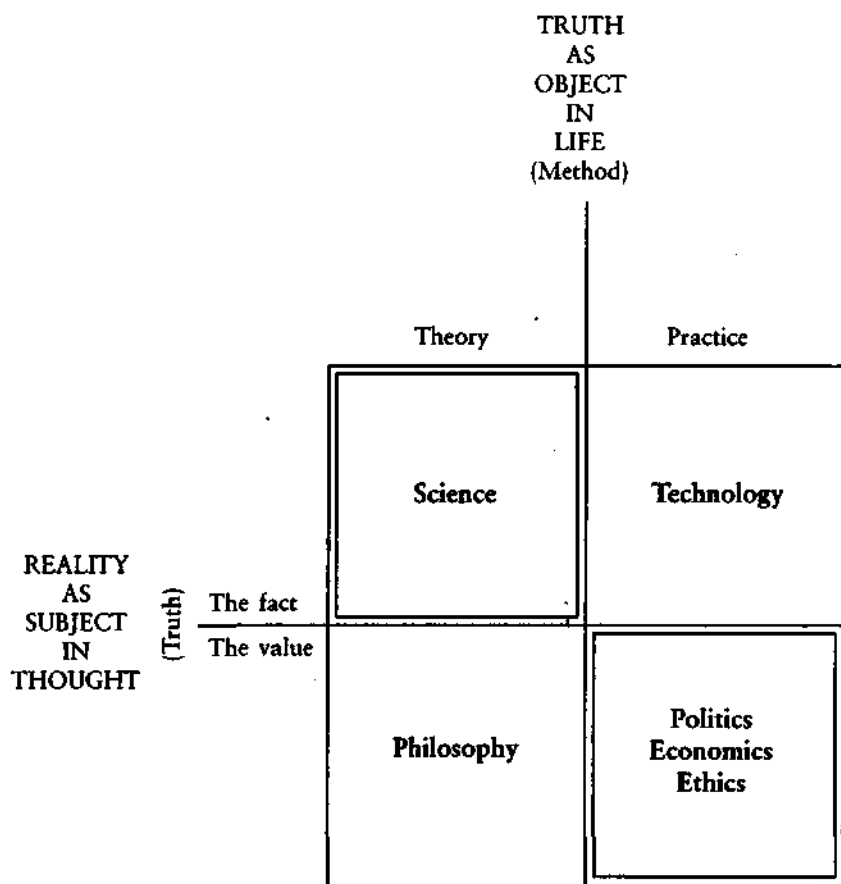


FIG. 2: Structure of the modernist regime

The dissolution of the unity of man's estate as a vision and a perspective to be realized in thought (truth) and somehow made concrete in life (method) led to the dissociation as well as the independence of its parts. Gloriously released from irksome mutual discipline under the ordered whole, the truth and the reality, thought and life, the inner and the outer, the truth of mind and the reality of the senses, simply flew apart, like God and the world, and renounced all necessary connection with each other (the horizontal and vertical axes on fig. 2). Their intrinsic dissociation left the new truths of modern

science totally powerless to influence the ethical conduct of modern politics or economics and vice versa, just as surely as their mutual independence divided off the mindless praxis of amoral technicism from the spirit of philosophy (the diagonal juxtapositions on fig. 2). The inherent logic of the European modernity had subconsciously determined that the mutual relations and attitudes of its science, philosophy, technology and politics, economics or ethics should be arbitrary and extrinsic to the special merits and respective categories of each separate domain.

The external uses or abuses of modern scientific knowledge, its contingent applications, were supposed to constitute its sufficient justification for others, though not for the positivist elite, who inwardly knew *the truth* of what they were about as a whole but habitually disowned the misuse of any particular truth. For example, a *truth* discovered by the scientist was to be taught to others and supported by them, the non-elite, if and when it was applicable to the good, let us suppose, of Enlightenment democracy or socialism and economic development, but not necessarily because it was the truth. By the same token, the manifest *untruths* taught by religion were to be happily tolerated and even quietly encouraged by the new regime for their extrinsic value in politics and ethics, e.g. in promoting social stability and cohesion. I should say that by the year 1800 or so this was already the avowed opinion of Saint-Simon, the messiah in France who first put forward positivism as a self-conscious philosophy and a system—later wrongly attributed by his pupil Comte to himself.

Be that as it may, Zwingli's unregenerate man of modernity in a sinful world somehow came true and gave birth to a science or a series of sciences which took as its first premise and chief task (a) the systematic unfolding of the presumed *diversity, separateness* and *difference* of things in the world (heterogeneity). Positivist man and the new scientist could avowedly only understand the truth in its several parts or individual fragments. God alone knew the unity of all things and he was by now thoroughly inscrutable. The present policy of man the scientist was to divide and conquer the external world now and save the internal world, hopefully still intact, for the kingdom of God to come. It was as if a man were to insist in a fit of insanity

or out of perversity that the outer circle of his horizon was visible and objective and therefore a fact, but that he himself, the knower, was merely a subjective value unfit to be included in his own scientific discourse. The only sight that modern western man ever had after that of the unity in variety that is truth would be through (b) finding or forcing merely *uniformity, similarity and resemblances* in nature or between nature and himself (homogeneity). We may call this the second premise and task of the new age.

In this positivist logic, either the first set of truths applied to the case or else the second set, but never both sets simultaneously to any event, system or context of situation. The positivist would not see the world according to the principle of unity in variety, but only in terms of the principle of homogeneity versus heterogeneity. It necessarily followed that the human mind should be applied to study all different things separately and only similar things together. Positivist dualism had wholly changed the relation of the whole and the part (structure) as well as the relation of the subject and the object (discourse), and non-dualism was ruled out of court in both cases, structure and discourse, truth and method.

There was almost no space left in the sciences of nature for the higher unity of mind and the world and of man's faculties of perception, cognition and volition, or for the dialectics of the subject and the object, or for the kind of unity in variety that transcends separateness and difference without neglecting them. All such modes of thought and experience were finally expelled or obliged to escape either into the thin air of religious idealism or into the marshlands of romantic art and irresponsibility, but in any case leaving behind the scientific firm ground to positivism. In the nineteenth century even the great labour of Marx would not restore the higher unity to the study of history, politics and economics as the sciences of man. In the twentieth century even the oft-cited great labour of Einstein would not restore the higher unity to the study of physics and mathematics among the sciences of nature, the macrocosm and the microcosm, in spite of his life-long search for a unified field theory of gravitation (Newton) and electromagnetism (Maxwell), not to mention also thermodynamics. Indeed the physicist Pauli once ironically said of Einstein's search that

'What God hath put asunder no man shall ever join.' I am unable to give any opinion about similar developments in chemistry or the biological sciences, ever since the cosmology of Paracelsus was taken to pieces, but one could name no less a person than Goethe as our witness in botany as well as optics.

Russell, who was the most able advocate in Britain of the use of the scientific method in philosophy as against what he called mystical, religious and ethical preoccupations, declared that in his opinion 'divide and conquer' was the maxim of success here as elsewhere (*analysis*). This led him to formulate the philosophy of logical atomism or absolute pluralism, as he called it, variety at the cost of unity. His senior and friend Whitehead, on the other hand, apparently took the other route and arrived at the organic conception of the universe as a whole, but this too was a vain effort at glueing together merely through links of simultaneity and succession the debris of the world left *after* the physicists had finished with it. Both men had neglected to start and to end with an adequate theory of the self and the other as well as of the world. In the twentieth century, therefore, neither philosophical atomism (*analysis*) nor philosophical organicism (*synthesis*), coexisting disjointed and separately, have dared to give any lessons to the special sciences which together represent aspects of the relation or its absence between the subject of study and the object of study, and this dualist regime of the European modernity is our theme.

Now let us return to consider the science of nature as a social institution of early modern Europe and ask the question, what was the west's real and true *social contract* of modernity? Altogether, I should say that science, religion and politics or the corporeal, the spiritual and the temporal had seemingly agreed under the new regime to go their separate and different ways. In England, it was Charles II who institutionalized the new arrangements in the middle of the seventeenth century and who set an example to other nations. In 1662, immediately upon the restoration of the monarchy, the private group of scientists already meeting in London, which had become known as the Invisible College for the cultivation of the new philosophy, was incorporated by royal charter to become the Royal Society of

London for 'the improvement of natural knowledge'. This autonomous establishment of the corporeal realm was just as important as, perhaps even more important than, the earlier medieval separation of the spiritual realm and the temporal realm, the church and the state. Anyhow, the latter separation was also renewed in form and effect in the same year by the Act of Uniformity, 1662. This marked the national separation and the persecution of the Nonconformists, the new Christians, who had severed connection with the established Church of England when it had accepted royal supremacy at the time of the Reformation.

On the one hand, King Charles II effectively bestowed the gift of autonomy on the cultivators of the new mechanical philosophy of nature; on the other hand, he implicitly confirmed the independence of the Puritans and dissenters of religion, the new Christians. In this way, the year 1662 set both the pattern for the internal organization and functional autonomy of modern western science and the pattern for its relations, or the apparent lack thereof, with politics as well as religion, discussion of either or both of which topics the Royal Society was enjoined to eschew.

Another century later and one could show that the intellect of the Industrial Revolution, 1760 to 1840, was produced by the mechanical institutes and the so-called dissenting academies of the Nonconformists, outside the two universities of England. The new inventors and captains of industry, from Watt to the dynasty of the Darbys, were not only all of them Protestants in relation to the Church of Rome but also dissenters in relation to the Church of England. In the structure of religion, society and culture, the Nonconformists stood precisely where Zwingli had stood in relation to Luther and the Pope. That is to say they were the men of work rather than ritual and of the chapel rather than the church or the state; and they were very often men who were dissenters by trade or occupation as well as by tradition. New developments of man in relation to his work were thus only to be expected of them; and such social origins were all of a piece with the whole logic of the European modernity in relation to science, religion and politics or the cycle of faith, knowledge and action.

V

POSTSCRIPT

A few years after my thesis was first published (1978), a new historical document came to light in Italy (1982) which has led Pietro Redondi to try and rewrite the history of the case of Galileo (1564–1642), both Christian heretic and leader of the modern scientific revolution of the mid-seventeenth century. It was generally supposed until now that Galileo was condemned by the holy office at his trial in Rome (1633) for upholding Copernicanism, i.e. the astronomical theory that puts the sun rather than the earth at the centre of the solar system. Now Redondi argues that Galileo had made in effect a secret deal with the authorities to escape the worst, so that he should be held guilty of a minor heresy (heliocentrism) and thus avoid the most dreadful charge and scandal of a major heresy, i.e. his challenge to the physics of the Eucharist.

Thus the trouble lay with Galileo's physics in the first instance and not with his astronomy; and mid-seventeenth century Roman Catholic theology could live with heliocentrism and the Copernican system rather more readily than with a physics whose atomism appeared to threaten the chief dogma of the Eucharist (transubstantiation). The newly discovered manuscript document is only about three pages long, a logically skilled but anonymous denunciation secretly lodged with the holy office in 1624 arguing that the Democritus-like atomism of Galileo's *Il Saggiatore* (1623) in effect brings into question 'the existence of the accidents of the bread and wine which in the Most Holy Sacrament are separated from their substance'. We are fully justified, therefore, in our experiment to examine the new science of nature as well as the new religion of modernity through the schismatic Eucharist controversy over the real and the true presence(s).

Mock on, mock on, Voltaire, Rousseau, ...
The atoms of Democritus
And Newton's particles of light
Are sands upon the Red Sea shore,
Where Israel's tents do shine so bright.

William Blake, 1757–1827

3



The Other Science of Nature in Europe

It is true [a] that the kingdom of nature must be helpful to the kingdom of grace; but as everything is connected in God's great design, we must believe [b] that the kingdom of grace is also in some way fitted to the kingdom of nature, in such a manner that this keeps the greatest order [unity] and beauty, so as to render the whole composed of both [grace and nature] the most perfect possible.

Leibniz 1900: 298

The part played by measurement and quantity in science is very great, but is, I think, sometimes overestimated. Mathematical technique is powerful, and men of science are naturally anxious to be able to apply it whenever possible; but a law may be quite scientific without being quantitative.... We must, therefore, in dealing with such a matter as animal behaviour, be content in the meantime with qualitative laws [e.g. Pavlov's laws of the conditioned reflex] which are none the less scientific for not being quantitative.

Russell 1949: 67f

I

THE PROBLEM AND THE FRAMEWORK

The discourse of nature uttered through man or what we call science is not spontaneous and self-explanatory, in my view,

whatever the ruling positivist assumption might be, but requires the discourse of culture and politics, i.e. knowledge of the culture/politics of the discourse spoken by man to man or to himself, in order to complete it. Therefore, we are proceeding here on the assumption that, apart from or along with its manifest content, the manner of formulating a question and correspondingly the *form* of the true answer expected from nature and the world, really help to define and indeed constitute the scientific and cultural/political universe in which a particular age, nation and class or community thinks and lives. To make such a large question somehow tractable for investigation is therefore also to define a particular viewpoint towards the history of the world. If we can possibly come to grips with these questions at all in India today, we shall have to make up our own minds independently, among other things, as to what had happened and how in the European modernity, which constitutes the chief single source of all our imports in the world of knowledge, power and culture. One can then begin to decide whether there exist perhaps other non-standard or alternative traditions and underground tendencies which could redefine the official European science or history, politics and economics or ethics handed down to us.

One possible hypothetical framework for such independent research would be to subdivide the history of the European modernity conveniently into three periods, stages or phases. Firstly its 'period of creation' or the Copernican/Galilean Age (1500–1650) to a consideration of which I shall return in a moment. Secondly its 'period of institutionalization' (1650–1800) when, for example, scientific laboratories and journals and new syllabi and textbooks for pedagogy really got firmly established in Britain, France and Germany. Thirdly the 'period of diffusion' (1800–1950) when this pattern of culture, institutional social organization and mode of thought were developed and spread throughout the world under European rule, supervision and example. We need not here at this moment go into the question of what further dimensions were added to the world system of the European modernity by the accession of the new territories of America, Russia and thirdly Japan.

One may look then for certain neglected symbols and events, texts, movements and persons from each period through which

or whom one could perhaps discover and demonstrate the alternative tendencies that have been hitherto ignored by the established official histories of universal knowledge. For instance, instead of only re-studying Copernicus, I had looked for someone at the moment of change around 1500 who would be equally modern and anti-traditional or reformist but perhaps in some alternative sense, i.e. closely linked not only to the Renaissance in Italy but also to what has been called the movement of the radical Reformation, the Nonconformists or the left wing of the Reformation as well as to the great peasants' revolt in German-speaking Europe north of the Alps. It turned out that, as was said in chapter 1, the perfect candidate was Paracelsus (1493–1541), who is already known to be important in the history of chemistry and of medicine and also heavily involved in the history of magic, in which interest has latterly revived, but whose importance in the histories of religion and politics is yet to be fully discovered and assessed.

I now believe that it would be indeed possible to show that there was a Paracelsian revolution (the chemical philosophy) just as much as there was a Copernican revolution (the mechanical philosophy), but that the first was stalled and soon went underground probably because it was connected at birth with the politics of the (unsuccessful) peasant wars in Germany, and with a firm ideology and practice of non-violence right in the middle of the Wars of Religion of the early modern period. To put the question another way, the radical European underground was not just a political movement of the first period; it had equally a scientific aspect and a religious aspect, which have been neglected. In the new Christianity, people with a mode of thought and experience like Paracelsus were represented by the Anabaptists, for example, and they were soon officially and forcibly suppressed, often by horrible means even beyond the fire and the sword, although they behaved completely non-violently and believed in non-violence as a creed. Incidentally, Paracelsus was well regarded, translated and published on medicine, science and alchemy in England under the Puritan revolution and the Commonwealth (1649–60), although where exactly his religious influence and political example stood during this 'world turned upside down' period is not yet known.

Similarly, in the second period that we have distinguished around 1800, the Paracelsus method and praxis were revived and updated from the radical German underground through the philosophy of nature and the scientific writings of Goethe, as we shall try to show in the present chapter. Some of his themes were subsequently developed, so to say, from the right by Hegel's *Philosophy of nature* (c. 1830) as well as from the left by Engels' *Dialectics of nature* (c. 1880). Both of them have been of course systematically ignored and/or denigrated as merely contributions of metaphysics (the right) or of politics (the left), and therefore held to constitute non-science as judged by apologists of the official positivist-dualist methodology of Copernicus, Galileo and Newton. I will attempt to answer the question posed at the beginning of this investigation regarding the possibility of a different non-dualist modernity or perhaps post-modernity specially on the grounds of science as well as of philosophy, holding religion and politics in reserve for later. It is to be urged in defence of Goethe that, in his semiological theory of nature or the science of the symbol, he was being in effect neither a materialist nor a simple idealist, the modern poet who had strayed into the wrong field by mistake, but pursuing in his secretly anti-modern way something like the unity in variety of God, man and the world. We will try and illustrate this hypothesis with some technical experimental detail rather than only in general philosophical terms.

About the fundamental phenomenon of colour as seen respectively by Newton and Goethe, even at the latest international conference held by the Goethe institute on the theory of colours at Weimar, 1998, the participants appeared to be divided on the question of representation. The technical aspect of the question is as to whether (a) the familiar Newton representation of the phenomenon (only light rays) is objective and so to be projected on the screen, putting the emphasis on the refrangibility rather than on the hues of colour, the violet being refracted the most and the red the least, while (b) the corresponding picture of Goethe centres on the eye of the subject and therefore like the image of the rainbow cannot itself be simply projected on to a screen, and whether (c) there can be some non-dualist, objective plus subjective, reconciliation yielding the co-production of the subject and the object,

involving the sun and the rain cloud as much as the human eye. The resultant unity in the duality might then indeed emerge as the common semiological language for science, art and religion, if not also politics and economics, making of them not a unilinear spectrum but a circle of cosmological as well as anthropological light and life, *zoe kai phos*, as a follower of the Hermetic tradition would say from the other self of the European modernity.

Newton's first paper of 1672 reduced the *difference of hue* between diverse sorts of light to the 'inequality of refractions' of various corpuscular rays. The best that you might get today is the admission of one set of hues for light (blue, green, red: physics) and another for pigments (blue, red; yellow: chemistry), etc., without any explanation of the trans-systems unity as well as the variety of the science of colour, chromatology.

II

AT THE FRONTIER: THE HUMAN BODY

Nature, gutted of gods,
Bent, like a thrall, to gravity's ponderous law,
The dead beat of the pendulum clock.

Friedrich Schiller, 1759–1805

As is well known, J. W. von Goethe (1749–1832) was a versatile universal genius, and apart from being a great German and European poet spent a large amount of his time and effort on methodical scientific work in optics and botany, geology, etc. Now the official science of the European modernity has responded to this by classifying and dividing Goethe's science of nature into two parts. (a) Natural history, the contribution that is classified as being merely empirical and 'descriptive', chiefly his botany and the morphology of plants, and that has been eventually absorbed into the official scientific 'mainstream' of course minus his so-called organic or vitalist philosophy. (b) Natural philosophy, the contribution that Goethe would himself classify as specifically physics, chiefly his studies on physical optics and the theory of colours, which are nowadays considered mostly wrong in fact and wrong-headed in theory

and method. This latter work is supposed by its kindest critics of the modernist persuasion to be of interest solely to people who are really only concerned with his literary work and imagination or intuition. It was all only a mistaken excursion of his artistic genius into the wrong field of knowledge: a man of the arts, which are products of the right hemisphere of the human brain, had somehow wandered into the sciences, which are the work of the left hemisphere of the brain.

But let us, at any rate for the sake of the present experiment, try and take Goethe's work on optics seriously as physics, part of a theory of nature, including human nature, and not only as the product of a misapplied psychology of literature, metaphor or poetry. Goethe himself estimated that there had been greater poets than himself in the glorious past, there were equally great poets living in his day, like his friend Schiller, and no doubt there would be still greater poets to come in the future; but that he was the only man of his entire century who knew the truth about colour and yet no one would recognize his superiority to Newton, who was wrongly holding the field. I propose to take Goethe's self-assessment seriously and invite you to see where it might possibly lead us—back to the occult philosophy as the modernists say they fear or forward to an alternative non-dual science?

Those of us who are of the British empiricist, inductive and experimental habit of mind might like to start by setting up the two experiments and verify the two results, the Newton spectrum and the Goethe spectrum, with single fine light and dark vertical bands on inverse contrasted backgrounds viewed through a prism, both spectra reduced with the fewest possible colour bands obtainable, as shown in fig. 3. The Newtonian view is of course already familiar to everyone from our official school physics. If there were to be a simple polemical exchange between the two different views represented, perhaps it would be with the Newtonian claiming that the Goethe spectrum is really only two elementary Newton spectra muddled up by the eye in perception, and so not really a genuine physical phenomenon by itself which would require it to be necessarily projected on a screen independently of the observer. The Goethean would possibly return the compliment and make precisely the same charge in reverse, namely that the Newton spectrum is really

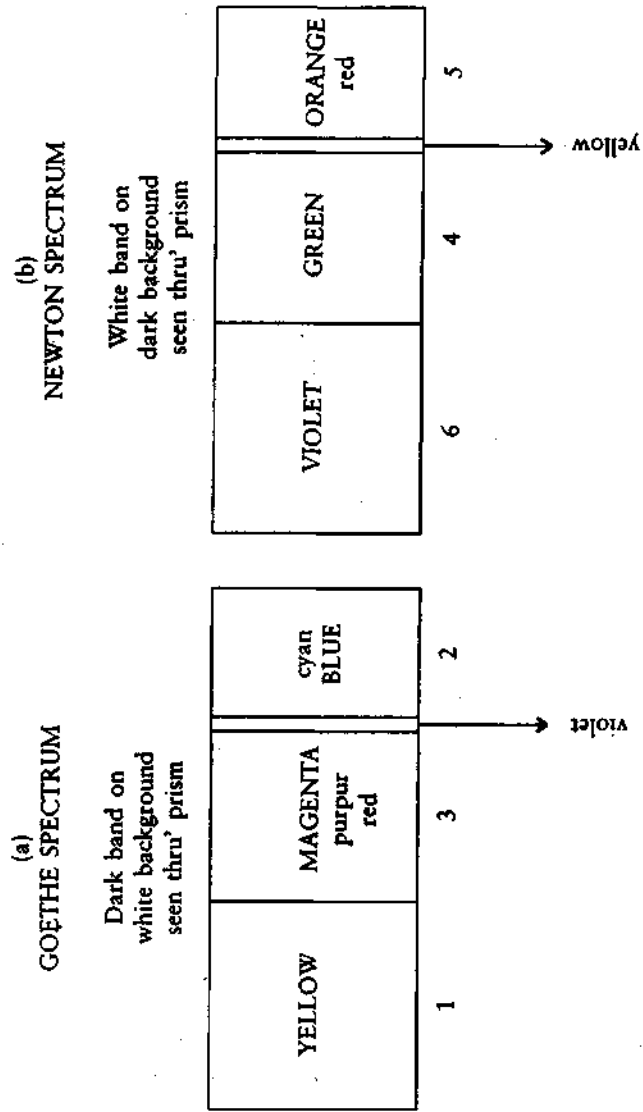


FIG. 3: Colours of the light and the dark

a complex mixture of two elementary Goethe spectra produced by their overlapping, addition or subtraction. If one watched the demonstrations and listened to the debate carefully, one would see that the underlying fundamental belief of the Newton school is that white light is a real physical phenomenon while darkness has no physical reality, being only a psychological phenomenon; it assumes also the corresponding dualism of physics and psychology as separate and distinct studies of the two different kinds of phenomena. A single fine vertical light or white band when seen breaking up through the prism into a spectrum of its monochromatic constituent rays is a natural physical phenomenon falling within the study of physics, while the Goethe view of its apparent inverse, the dark band similarly viewed on a white background through a prism and incidentally showing the magenta hue that is lacking in both Newton and the rainbow, is a kind of optical illusion useful only for artisans, biochemists and artists.

So those people who are by temperament or training of the opposite French, deductive or philosophical habit of mind would be better advised to start with the rationalist's question as to whether the two different spectra of Goethe and Newton are both only 'models of reality', right or wrong, or are perhaps also to be classed as models of our knowledge of reality, 'models of truth'? Or can there be still a third possible solution of mediation positing a non-dualist relation between the truth and the reality as the object of science?

The respective experimental and philosophical discourses will help us to explain that what Goethe truly wanted to demonstrate was that the light and the dark are not two dualistically separate and different realities (chalk and cheese) or even unilinear opposites (head and tail or north and south) in the way that they had been presumed to be hitherto. The phenomenon of the light and the phenomenon of the dark are both simultaneously physical and psychological, like the phenomenon of the rainbow, when seen from the single 'symbolical' view of (say) physiology and the human body or of the human senses and the imagination as well as reason. To make this representation at all intelligible, if not to prove it experimentally today, one has to assume I think that the underlying structure of Goethe's universe of discourse or cosmology is as follows. (a) The whole

sensible world, *without the observer*, is divided into three parts: the medium, which is any kind of matter, solid, liquid or gas, that fills space, and another part that itself consists of two segments, the light and the dark, each of which is the condition of existence for the other, like the crest and the trough of a single wave or like motion in the middle and its apparent absence at the two ends of a swinging pendulum. (b) The whole intelligible world, *including the observer*, is perceived or assumed to be interrelated I think in this sort of way, i.e. understanding the unity and the struggle of opposites as somehow mediated and non-linear, occurring like the warp and the weft of a single woven fabric, as shown in fig. 4.

Thus we are asked to imagine the eye of the participant-observer as situated at two different positions successively—the first where it looks at the light through a darkened medium (yellow, developing to yellow-red and ruby), and the other where it looks conversely at the dark through a lightened

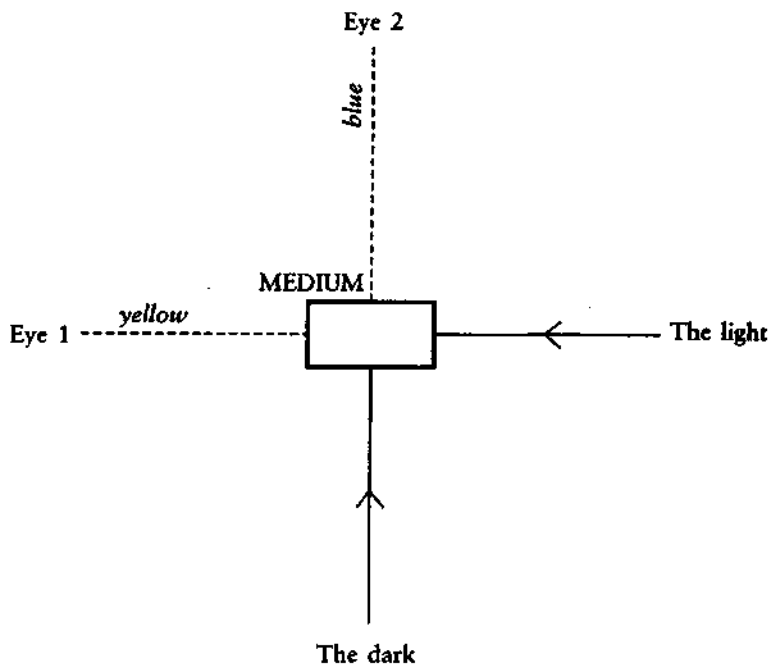


FIG. 4: The unity of opposites

medium (blue, developing to blue-red or violet). There is no experiment or argument in Goethe's *Theory of colours* (English trans. 1840) which would assume or imply that the light and the dark affect each other directly, physically or causally: this inference would be a simple misreading of the text. Goethe's experiments and argument are rather to the effect (a) that the light and the dark are truly separated and exist in different dimensions, if only as presence and absence, but that they conjointly and simultaneously affect the material medium defined as that third thing which functions in its turn effectively both to hold them apart and to bring them together according to the context of situation; and (b) that it is their respective threefold existence and mutual interaction in the roles of correlation, opposition and mediation that produces the effects on the eye which we finally call the phenomena of colour. This explanation and interpretation of mine are also borne out by some epigrammatic poems, c. 1810, that Goethe wrote at about the same time that his book on colour was published in German. I have therefore represented the phenomenon of colour in fig. 4 diagrammatically by showing the 'light' and the 'dark' as existing simultaneously along two perpendicular axes, and so intersecting or interacting rather like the foreground and the background only in relation to the medium and through it the eye of the participant-observer.

Goethe says quite plainly, and I follow him, that the two basic physical hues or colours are the yellow and the blue, howsoever they are produced. Eye 1 will thus see yellow because it looks at the light through the darkened medium, and Eye 2 will perceive blue because it looks in the opposite situation or configuration, i.e. at the dark through a lightened medium. I suppose that this also explains why we commonly speak in the English language of the yellow press, which is a medium that obscures the light, and also of blue movies, which is a medium that illumines the dark. The meaning and effect of all this is that the sensible/intelligible world opens and discloses the structure or the grammar of its whole system of discourse to the human eye or the sense of vision through the language of colour, which is not to be dismissed merely as a secondary quality of the world. The Goethe project here is the non-dualist Neoplatonist one of combining the human science of nature (the external world)

with the natural science of man (the self) from a single 'symbolical' view with the human subject at its centre in relation to the reality of the senses, imagination and reason, which I shall try and define further.

It will be quite apparent by now that in this exposition Goethe had in fact taken the experimental results of Newton's prismatic analysis, where the colours (rays) are laid out from the violet to the red ends along a unilinear spectrum and quantitatively according to their respective wavelengths and/or frequency, and then transformed the series to curve back upon itself so that we can notice that its two ends, violet and red, have some quality like redness in common, i.e. maintaining the purely quantitative sequence but trying to add to it the human perception of qualities. Goethe in fact rejoined these two ends of the Newton series by introducing the new colour or hue that

he calls *purpur*, pure red or magenta, already produced in the experiment of the Goethe spectrum, so as to complete the circumference of a circle of colours or a ring of hues; and he encloses the whole phenomenon of colour, now assessed qualitatively as well as quantitatively, around its required natural percipient, the human eye (fig. 5). The student of colour should see with his eye and give full value in his mind to the fact that, in quantitative as well as qualitative terms, there exists a logical and empirical space for this magenta hue, if only *in absentia* in the Newton spectrum, somewhere between the violet or the Italian red which remains on the blue side (left) and the spectral orange-red or the French red which remains on the yellow side (right) of the chromatic circle.

In other words Goethe places at the centre of his scientific concern, not something alone from physics, the purely material and objective, nor yet alone from psychology, the purely mental, subjective and artistic, but from where the two domains are joined (or disjoined), that is to say, the human body when considered from his non-dualist point of view. The human body can be defined in the manner of Goethe as being that part of the external world which mind can know subjectively, and as also simultaneously being that part of the self which one can know objectively. The human senses, far from being merely windows on the world, are the artefacts of mind and labour that mark the frontier and mediate between the facts of the external world and the categories and the values of mind. By the frontier here is meant that point of conjunction and disjunction across which is established the unity in variety of the eye, the mind and the hand or of the faculties and the experience of perception, cognition and volition or of self, the world and the other. I think that the human body was for Goethe therefore the best scientific laboratory, the perfect experimental medium for the interlocution of man and nature, mind and the world, the subject and the object. Fig. 5 thus represents an implicit transformation of the phenomenon of colours from the view of the official Copernicus tradition (Newton) into the view of the radical Paracelsus tradition (Goethe), since taken together as a whole it assumes and proves that man knows the world only in himself as well as that man knows himself only in the world, treating the world of things/signs as one of symptoms, the part

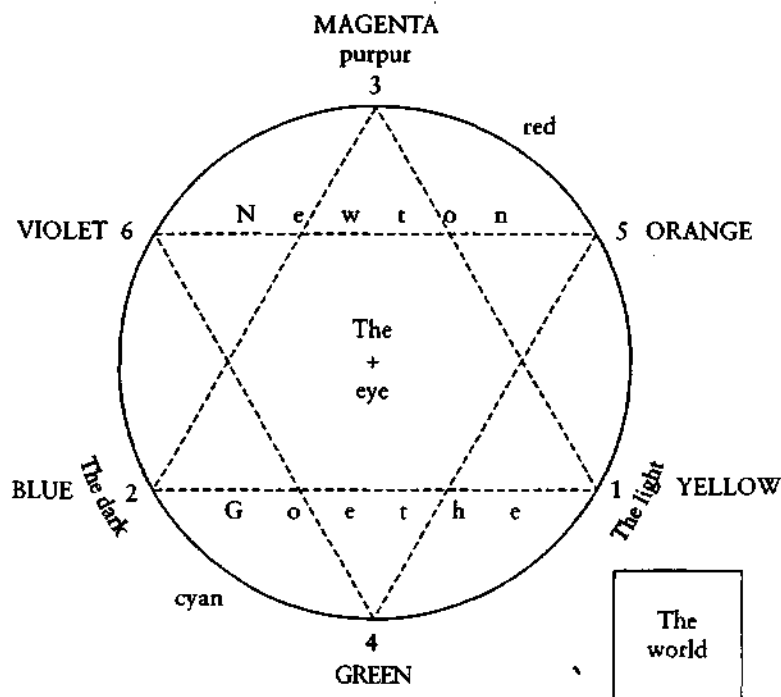


FIG. 5: Thesis, antithesis, synthesis/reflection, elaboration, completion or reproduction

and the whole, and our non-dualist knowledge of it to be like the writing and reading of signatures (semiology).

III

THE SCIENCE OF COLOURS

Goethe : Newton
 ::
 Light : Matter
 ::
 Truth : Reality
 ::
 Colour : Rays

Let us now, setting aside the purely polemical part of the debate versus Newton, return to the structure of Goethe's own

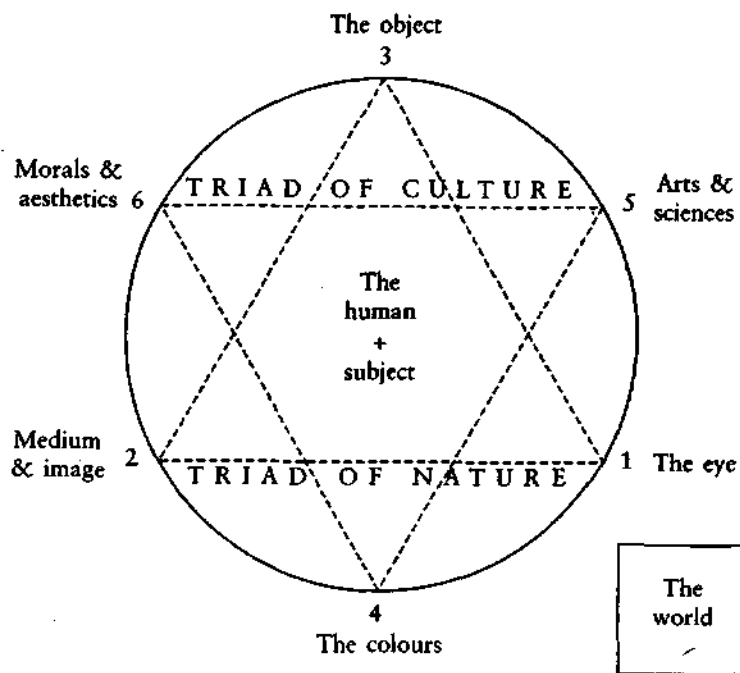


FIG. 6: Goethe's book of colours

exposition in his book, *Theory of colours* (1810) published in German, which is divided into two main parts, each again subdivided into three chapters (fig. 6). The very first chapter is that on the eye of the subject: its focus is physiological: we shall take it up in a moment. The next chapter then moves from the subject towards the object. It is on physics, dealing specially with the (temporary) image formed in the medium and seen by the human eye, the unity of the percept and the concept. The third chapter is finally on the chemistry of colours, i.e. as pigments permanently fixed in the object of nature, science, technique or art. In a Newtonian scheme of course the exposition, even if it were the same in its contents, would be entirely differently arranged in its form, and would therefore possess a different meaning and effect. The successive chapters would follow one another strictly in order of the complexity of phenomena, so that the assumed 'fundamental' science of physics would come first, the chemistry would follow second and the physiology third and last, with the human observer held throughout to be ideally neutral, standardized and out of the picture.

One has only to recall the arrangement of modern school syllabi and textbooks to recognize fully this official developmental sequence of matter, life and mind; and it is maintained whether one ascends the ladder by 'emergence' for the sake of evolution or descends it by 'reduction' for the sake of explanation. The Goethe scheme, on the other hand, puts first the human agency of knowledge, and that knowledge is to be obtained by the processes of perception, cognition and volition or by the eye, the mind and the hand, forming together a single human and natural cycle of participant-observation in the scientific experiment. It is perfectly logical and sensible, according to Goethe, to study first self and the body, the instrument that correlates, separates and mediates between mind and the world, so that we may not forget either of the two questions of knowledge and life, 'What is the system of the world?' (the natural sciences) and 'Who am I?' or better 'Who are we, I-and the other?' (art, psychology and religion), and so keep the nature of things and the nature of signs together, e.g. in effect regarding colours as symptoms or signatures that are both natural and cultural at once.

In his very first chapter on human physiology and the eye, therefore, Goethe develops the concept of the after-image of colour by 'reflection' in the eye. Such after-images are known to occur in the eye according to the three diametrically opposed pairs of colours, the three elementary or simple hues (1, 2, 3) invoking the three complex hues (6, 5, 4) and vice versa, on what he calls the chromatic circle (fig. 5). If one looks fixedly at the magenta, purpur or pure red for some time and then shuts one's eyes, one will not perceive the same hue now fading when the stimulus is removed, but one will see a complementary green after-image which of course then fades, and the same applies vice versa: one sees a magenta after-image after fixedly looking at green. The same experimental rule applies between the opposed pair of yellow (elementary) and violet (complex), and between the opposed pair of cyan blue (elementary) and orange-red (complex), which likewise reciprocally invoke one another.

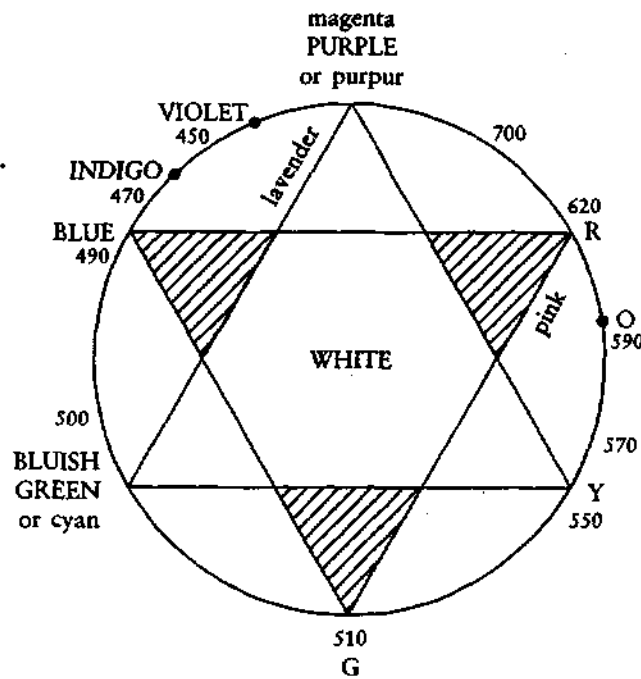
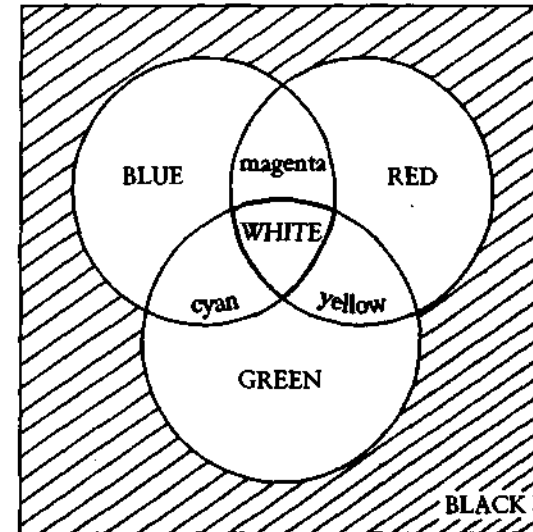
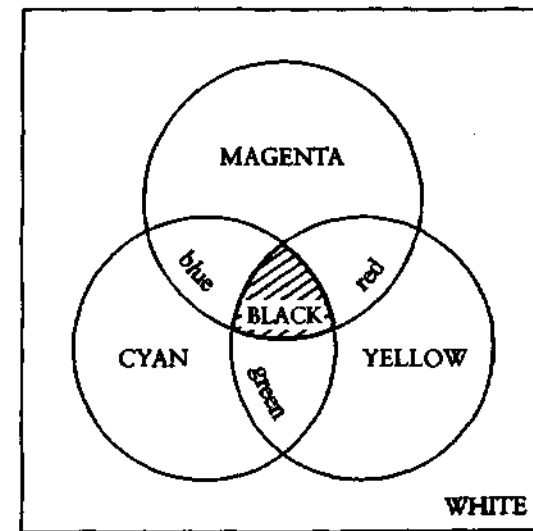


FIG. 7: The colour star today (wavelengths 450-700 nanometres)



a) Additive mixing of coloured lights



b) Subtractive mixing of coloured substances

FIG. 8: Addition and subtraction of lights and pigments

in the human eye. Hence the system of oppositions is not so much physical or psychological, material or mental, as it is a system of physiological complementarity, and it lays the foundation for what is to follow. Alternatively, one may conclude that the processes of inter-convertibility and totalization of the Goethe spectrum (elementary) and the Newton spectrum (complex), the two apparent opposites both physical and experimental with which we began, are completed and made possible through the physiology of the human eye, and that this is readily empirically verifiable by the experiment of the after-image in the living subject, the human agency of 'reflection', if I may designate the process by that term.

The second chapter of the *Theory of colours* is on physical colours of longer duration than the after-image, and with its focus on the image formed in the medium as the unity of the concept and the percept of colour. It is the hardest to swallow for the Newton school, and thus gives rise to violent controversy when it is considered at all. I have already tried to explain its underlying fundamental opposition of the yellow and the blue as shown in fig. 4 in terms of the light and the dark, warp and weft, the medium and the eye, and that is the best I could do in defence of Goethe on this point. I may now add, however, that it is just these three colours of the minimal Goethe spectrum, yellow, magenta and cyan (blue-green), which one may see marked in that order on the newest colour computers, first produced by Goethe's experiment of fig. 3(a), which were then integrated with their respective complementary colours, violet-blue, green and orange-red as shown in fig. 3(b) and produced by the minimal Newton spectrum, in order to produce the total configuration of the chromatic circle or the colour star, fig. 5. Nevertheless, the physicists of today remain convinced as followers of Aristotle that their three primary colours are blue, green and red, adding up to white from blackness, and that the other colours, yellow, magenta and cyan, can be left to the chemistry of pigments or be derived from the former by suitable additions or subtraction, starting with white and ending with black (fig. 7).

The meaning and effect of this new wickedness are represented in fig. 8(a), the additive mixing of coloured lights (physics), and fig. 8(b), the subtractive mixing of coloured

substances (chemistry), which together would yield the colour star/circle of today's school textbook as shown in fig. 7 (which follows the Commission Internationale de l'Éclairage, 1931). The best that can be claimed for this legerdemain is that, on the basis of new and more accurately fine determinations of wavelength/frequency and the reactions of three types of rods and cones in the living eye, it has drawn the yellow, orange and red a little closer together (right), and also pushed the green and the blue further apart to make room for the blue-green or cyan hue in between (left), but leaving the green and the magenta, purple or *purpur* as two paired polar opposites as before. What is to be noticed and regretted, however, is that the centre of the circle is no longer occupied by the eye of the subject, who is out of the picture and is now replaced by the white—but without its percipient so that the after-images are no longer to be seen or considered, i.e. physiology or psychology is expelled from physics or chemistry again, the science of colour disjoins self from the world, and we are back to Newton. Of course in today's nuclear physics the three basic *quarks* or sub-elementary particles come in three colours according to their respective quantum properties or qualities, red, yellow and blue (three primary pigments), but it will be said that this is purely notional (subjective) and it might just as well be red, green and blue (three primary lights).

The frequent mention above of magenta, or Coronation red as it was named in honour of the official robe of this colour worn by Elizabeth II in London, 1953, brings us to Goethe's third chapter, which needs to be read with some knowledge of early modern alchemy in Europe since this is the third dimension that Goethe brings to his unity and struggle of opposites, the chemistry of colour as fixed permanently in the object. The yellow and the blue, when these two basics are combined somehow 'raw', scalar as it were, will produce green, the symbol of earthly peace and harmony (fig. 5, bottom). But if the two are first separately intensified, augmented, developed (*Steigerung*) or somehow 'cooked' (vector), each of them will experimentally approach magenta or pure red, the single hue of their true heavenly advent as well as reconciliation (fig. 5, top). This colour to which Goethe gave the name *purpur*, physically definable only by its physiological opposite green, is the one by

which he rejoined the two extreme ends of the unilinear Newton spectrum, the violet and the orange-red, whose reddish quality in common is given no value by the Newton scheme because of the latter's purely mensurational terms of the frequency and/or wavelength of rays. *Purpur*, magenta or pure red, as Goethe said, somehow includes, either in actuality or potentiality, all the other colours, but it is not to be found at all in the Newton spectrum or for that matter in the much-admired rainbow of nature. In early modern alchemy, e.g. Paracelsus, the white when it is put into the furnace passes through the yellow and orange stages or phases to emerge as the majestic red, master of all colours, 'the oriental king' or the rising sun (I suppose). It is of course the colour of the passion of Christ as Saint Basil said when he allocated the four colours, the colour of the blood of the lamb, the mediator, who is begotten before the dawn of creation and before all ages of history and slain from the foundation of the world; while the rainbow of nature (the virgin's girdle) is correspondingly in early modern Europe after the meditations of Birgitta of Sweden the symbol of the virgin Mary, the feminine mediatrix, whose loving intercession with God men may expect at the apocalypse and the end of the world.

From our semiological point of view, the thing to notice is that the triadic form of the minimal Goethe spectrum represented by the upright triangle in fig. 5 is made up of 'elementary' colours here numbered by me 1, 2 and 3, the two polar opposites of yellow and blue resolved or reconciled into a new or original third: thesis, antithesis and synthesis, let us say. Then occurs that vital new process, the jump or the leap from colour 3 to colour 4, which I can only describe for the present as the process of reflection, the 'pure red' being changed through the eye into green, its after-image. After this moment of reflection or mutation in the cycle of transformations, the colour is further elaborated into two more 'complex' colours, colour 5 (orange) on the one side towards yellow, and colour 6 (violet) on the other side towards blue, which completes the triadic form of the minimal Newton spectrum as represented by the inverted triangle of colours numbered 4, 5 and 6. Thesis, antithesis and synthesis are to be necessarily followed, complemented and completed by the processes of reflection, elaboration and

reproduction or completion, with the human agency, which is here the eye, occupying the centre of the circumference of forms, the colours of the external world that lies all around. The elementary triad of the Goethe spectrum and the complex triad of the Newton spectrum, shown separately on fig. 3, thus come to be interwoven on the fabric analogy by metaphor and metonymy as alternating neighbours on the circumference of the chromatic circle, and at the same time they preserve their respective physiological oppositions as after-images through the eye in the centre, so that the numerals allocated to any complementary pair of colours together add up to seven, as one can see from fig. 5.

The concluding suggestion that I want to make here is that the relation between the two reflected as well as interwoven triangles of the hexagram or the colour star, the Goethe triad (1, 2, 3) and the Newton triad (4, 5, 6), in some way ultimately represents the relation between the macrocosm (the elementary) and the microcosm (the complex) in the completed Hermetic theory of man and nature, that is, if you will allow as scientific a theory of nature that will include human nature, its physics, chemistry, physiology and psychology. This relation is not altogether or simply that of 'correspondence' as it is termed in the relevant cosmological literature where it is assimilated to the theme of similitude, but rather it is the relation of what I have preferred to call reflection, which is made up equally of similitude and difference so that the microcosm is not simply/only the macrocosm writ small, as it were, but the macrocosm somehow reflected, elaborated and reproduced or completed through the subject or its equivalent. This process of reflection, which I assume to occur in nature as often as in culture, evidently does, among other things, abolish what is the important distinction of metaphor and metonymy. For in the topology of the chromatic circle, every alternating pair of neighbouring simple colours is itself 'intercalated' by a complex colour, so to say, and every alternating pair of complex colours has correspondingly intercalated between them a simple elementary colour. The triadic forms and varied dynamic transformations of our two experiments thus continue to resemble one another in similitude, yet now with the recognized difference that each of them is also the perfect inverse of the other and that the two

together represent processes which are formed around the eye of the subject and also objectively in the external world existing all around the circumference of forms: thesis, antithesis and synthesis (the elementary forms) are followed by reflection, elaboration and completion or reproduction (the complex forms).

The second half of Goethe's book of colours is also subdivided into three chapters, like the first half, but there is a moment of change between the two parts which is indicated in a quasi-occult way by the numbering of the sections, which stops short at this point, and it is also indicated by the writing. At any event the fourth chapter explains Goethe's general theory of the phenomenon of colours insofar as this is explained at all in the book. In the fifth chapter he 'elaborates' on the phenomenon through knowledge of the sciences and the arts, including of course the crafts, e.g. painting and dyeing. In the sixth chapter he concludes with the further significance of colour in culture, religion and psychology or morals and aesthetics. At first sight one is rather puzzled as to why the author should explain the general theory of colours only when he comes to the fourth chapter. The rationalist philosopher would have surely put it logically at the beginning of the book. The pure empiricist on the other hand would have arrived at the general theory, apparently solely by the route of experiment and induction, at the end of the book. But Goethe has placed it squarely in the middle of his project at the moment of reflection, as we have defined it, when he changes gear and moves or leaps from the elementary forms to the complex forms, the macrocosm to the microcosm and the sciences of nature to the sciences of culture (fig. 6).

His whole arrangement of the phenomenon of colours as well as the sciences and the arts around the central human subject forms a challenge and an alternative to the official modern classification of primary and secondary qualities, etc. Goethe proceeds here again by the method of the unity and the struggle of opposites setting up polarities, types of opposition and mediation or by the method of thesis, antithesis and synthesis to be followed by the moments of reflection, elaboration and reproduction or completion as I have summarized in fig. 6. Finally, the penultimate paragraph of the book contains

a thinly veiled reference to his religion of Jesus and Mary, the mediator and the mediatrix, which I hope to take up on some other occasion for discussion. This was wholly opposed, whether Goethe knew and intended it or not, to the Christianity of Newton, who would have nothing to do with Mariology as is well known from the published sources, and from whose many unpublished writings on religion we now also know that Christology was his other weakest point.

Without going too far further afield into the great corpus of Goethe's scientific work, I shall simply mention that a similar or homologous structure of observation and classification, description and comparison, analysis and explanation will be evident from Goethe's well-known botanical studies, specially the *Metamorphosis of plants* (1790), if we follow the same method of reading, understanding and explaining his discourse of things and signs, symbols or symptoms. The developmental life-cycle of the simple annual plant is decomposed by Goethe into six stages, which begin with the seed splitting into the pair of its two opposed parts, the one going up to the light and the element air (the stem), while the other goes down to the dark and the element earth (the root). The first part then splits further into two, the male (giving) and the female (receiving), together forming the vertical stem and the spiral leaves, the two reunited at a higher level in the flower. So the pair of opposites produces finally the fruit and achieves its completion and/or reproduction through the seed or the bud or through both of them. The simple elementary triad here is that of the growth of the archetypal individual plant composed of the stem and the root, the leaf and the flower, as say children normally draw it shown in a flower pot. Then follows the new moment of reflection of the archetypal individual, who can never alone reproduce himself or herself, into the nature and the conception of the plant as a species, the transformation being achieved through what Goethe calls the life-force at the centre of the life-cycle or the circumference of growth, development and reproduction. This new moment of reflection is then succeeded by 'elaboration' in the fruit and final reproduction through the seed or the bud, which concludes the annual cycle of diachrony. Here again the stages or the phases of growth of the archetypal individual (a, b, c) and the processes of reflection, elaboration and reproduction of

the species (d, e, f) are complete polar opposites, each being a kind of inverted mirror image of the other, and yet the two are also perfectly symmetrically interwoven by the temporal sequence of the life-cycle (fig. 9), individuation being followed by holism and the organic whole returning back again to the individual.

Here also then is the unity as well as the struggle of the light and the dark with the world of bodies, the elementary forms and the complex forms, etc., but now with the focus and the rhythms of expansion and contraction, diastolic and systolic, in succession (diachrony) taking the place of the forms of metaphor and metonymy, oppositions and mediations in simultaneity (synchrony), as was the case with the chromatic circle or the colour star (cf. its latest version, but without the concept of reflection, in Boetius, Lauridsen and Lefevre 1998: 38).

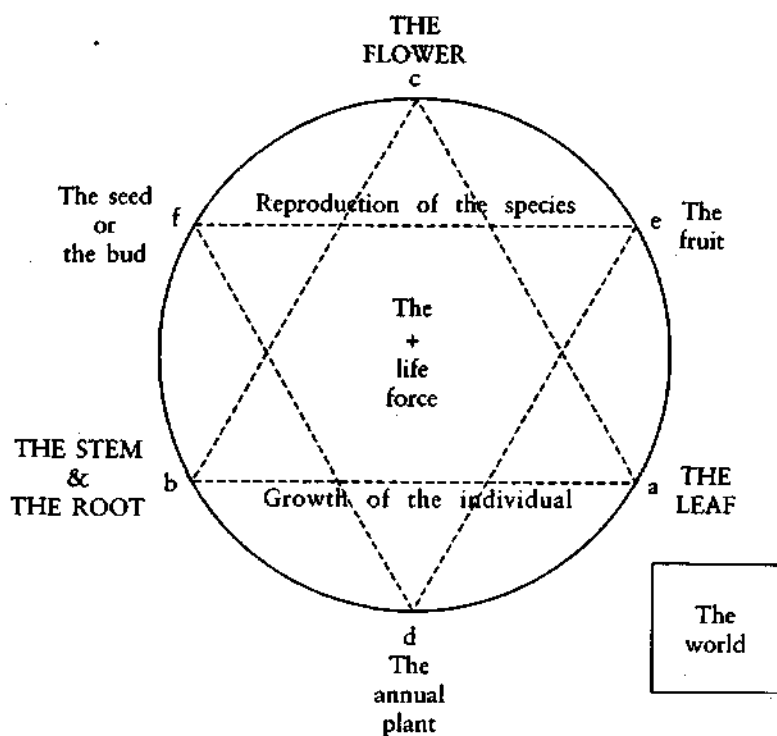


FIG. 9: The metamorphosis of plants

IV

THE RADICAL EUROPEAN UNDERGROUND

I had separated the heterogeneous Rays from one another...so that there appeared as many Degrees of Colours, as there were sorts of Rays differing in Refrangibility... For the Rays to speak properly are not coloured. In them there is nothing else than a certain Power and Disposition to stir up a Sensation of this or that Colour...as Sound in a Bell or musical String... Do not several sorts of Rays make Vibrations of several bignesses, which according to their bignesses excite Sensations of several Colours, much after the manner that the Vibrations of the Air, according to their several bignesses, excite Sensations of several Sounds?

Newton 1931: 122f, 345

After having taken so far a sort of technical guided tour through Goethe's scientific work on the theory of colours in some experimental detail, I should like now to revert to some very general historical and philosophical considerations relating to 'other' modes of thought and codes of conduct, principles of organization other than of the European modernity, in the study of nature. Very often one reads in the established official histories of culture that what chiefly characterized the early modern period in European thought, 1500 to 1650, the first crucial period culminating in the great scientific revolution, was that people went over from a theological or a magical model to a mechanical model of the universe. Only later on in the second or perhaps the third period did they discover or rediscover the organic properties of the cosmos as a whole; and still later in modernity or perhaps post-modernity are the Europeans seeking and finding its spiritual quality or consciousness for study. I am sceptical of the account and not persuaded that this is how it really happened in history; and to try and advance or investigate an alternative hypothesis I had selected and reformulated the Paracelsus tradition and specially the problematics of Goethe, who has been always unjustly represented as an organicist by his critics as well as by his defenders, and have chosen to present his semiological and experimental physics or optics contra Newton rather than simply present Goethe's biology, marked apparently by

holism as well as individuation, which he called physical zoonomy.

I think that the simplest way to put the results obtained so far is in the form that the official scientific tradition of Copernicus, Galileo and Newton was always thoroughly dualist, emphasizing both the separateness as well as the difference between the subject and the object, the thing and the sign, symbol or symptom, the percept and the concept, the light and the dark, matter and spirit. It habitually and compulsorily ascribed to the one a purely physical mode of existence and experience, which belonged to the agency of the external world and the study of which was in principle simple, objective, experimental, quantitative and systematic, while it ascribed to the other at best, when it did not lapse into simple positivist reductionism, a purely psychological or cultural mode of existence and experience, which belonged to the agency of the human mind, individual or collective, to history and society, and the study of which was therefore complex, humanistic, interpretative, qualitative and subjective. During the same period, 1500 to 1650, the radical European underground, on the other hand, without in any way denying in the works of its best representatives the valid opposition of mind and the world, the thing and the sign, matter and spirit, always looked further as its scientific duty for a third integrative, correlational or mediatory solution which would have the characteristics of both opposed terms although being itself neither of them. Thus we have the human body viewed as the mediator between mind and the world, the artefact mediating between the fact and the value, or the reading of symptoms (semiology) as mediating between the literal and the figurative, the thing and the sign, or the forms and figures of topology, ratio and proportion as being both qualitative and quantitative.

This European underground of counter-science, truth and method should also have taken up in its theory and practice the study of material culture or the relations and instrumentalities of labour, as Marx and Engels would have had it, as the point of conjunction/disjunction of man (and woman) and the environment, internal and external, the subject and the object, in the way that Goethe had talked of practical gardening or the techniques of dyeing and painting and other crafts as

representing the unity of the eye, the mind and the hand or of perception, cognition and volition, but I have not yet found that example in history and society.

Anyhow the official knowledge of the modern period saw only two logical/empirical possibilities as existing between any two things or events and processes, (a) homogeneity and equality or (b) heterogeneity and inequality, i.e. either the two were similar and together or they were separate as well as different, whether in the human mind or the external world or between the two. But for the non-dualist underground counter-science, truth and method there are also two other logical/empirical possibilities to be considered, i.e. the two things, events or processes might be separate but similar (correspondence, equivalence, homology or competition) or the two might be different but together (complementarity; exchange, division of labour), specially in the relation of the subject and the object. We have attempted to show that this mode of thought and experience, which validly encompasses the whole field of all four possibilities, underlies and can explain the truth of Goethe's science of colour (fig. 5); and I am quite unable to agree that the latter's achievements and potential should be excluded and discarded from our science of nature as being somehow inherently non-mathematical (topological), non-quantitative, non-analytical, holistic, vitalist, organicist or humanist in its methodology. It is simply another classification, method and system of sciences (fig. 6), and no friend of the Platonic cosmology needs to claim anything more or ask the enemy of the 'occult' philosophy to concede anything less.

If the unstated dualist-positivist charge against my kind of defence of Goethe is in particular that the colour or hue of magenta, *purpur* or pure red through which Goethe attempted to reunite the qualitative and the quantitative aspects, for example, is not to be found in the Newton spectrum or in the rainbow or in the rest of official physical nature but only among living plants, animals or humans and the artifice of artists, then Goethe's advocate is better advised to plead guilty in court. Goethe stated explicitly that the natural rainbow or the Newton spectrum is in his judgment 'deficient' in the hue of *purpur*, and one may add just precisely because this colour belongs in his system to that part of the external world where the light seen

through the dark medium (fig. 4, Eye 1) is somehow put together with the dark seen through the light medium (fig. 4, Eye 2). If this further configuration of mediation, integration or the conjunction of opposites on top of their disjunction or heterogeneity does not occur in official physical nature in the modern European system, then surely human knowledge, life and culture must be allowed the possibility of completing that dualistic conception and that system of physical nature, as with the experiment of the Goethe spectrum, rather than necessarily remaining confined to the further dualism of either simply assuming and continuing it (scientific materialism, empiricism or naturalism) or simply leaving it alone or merely contradicting it (social or humanist idealism, rationalism, hermeneutics or the philosophy of art for art's sake).

Therefore, let us approach this conclusion of the defence of Goethe with my general historical assessment that the function of light in the cosmology of the radical European underground, i.e. including nature as well as culture (or grace), was in effect threefold; and that there were perhaps in all three candidates for that function. *Lux* in the sixteenth century radical Reformation of Servetus, say, had the same functions as the *Logos* in the gospel of Saint John, which was then newly revived, or as the *Pneuma*, spirit or life-breath of the Neoplatonists. For the radical European underground the phenomenon of light represented the mediation of the opposition, upward-striving spirit versus matter or the principle of gravitation, just as the word represented the mediation of the opposition, thought versus deed, or as the living breath represented the mediation of the opposition, the inside versus the outside. The threefold functions of light, the word or the life-breath were thus the multiplicative (source of magnitude), the communicative (motion or change) and the mediatory (conjunction of opposites). This position is (I suspect) already clearly defined for the phenomenon of light by Grosseteste at Oxford (1175–1253), whom some have wrongly tried to annex as the remote ancestor of Newton, who on the contrary almost always stuck at any rate in public to his attempts to reduce the nature of light (rays) to the locomotion of mechanical points (corpuscles), without the power of multiplicative extension, against all comers of whom he knew, e.g. the wave theory. The same

Neoplatonist cosmological background and the full experimental method were also to be found in the Islamic Sufi world, specially in the work of al-Hasan ibn al-Haitham (AD 965–1039), al-Shirazi (1236–1311) and his pupil al-Farisi (d. 1320), whose Arabic writings, method of approach and experimental results were most probably known directly in Paris and indirectly at Oxford.

The present investigation then should help to explain the apparently small technical detail as to why Goethe would have nothing to do with the view that the phenomenon of light is propagated in straight parallel lines (rays), either approximately in nature, as in the arrival of sunlight on the earth, or exactly and precisely, as nowadays in the laboratory laser. I think that Goethe supposed on the contrary that light travels as a sphere expanding from or contracting to a centre or a point, according to the mathematical inverse square law of propagation just like the law of gravity, so that every single ray or segment of it was shaped like a cone and not like a pencil. Goethe's physics of light was therefore altogether one of participant-observation; it concentrated on the study of the situational, transient or occasional image in the medium, the unity of the subject and the object or of the concept and the percept, produced like the phenomenon of the rainbow according to al-Farisi and al-Shirazi. Goethe took some pains to try and show that the whole of the space illumined by the sun through even the largest window is resolvable into the image of the sun, formed inverted except in its dead centre, plus the size of the opening through which the light entered a room. He stated precisely that if we take a series of square apertures of any size we like for the experiment, we shall find that the image thrown on the opposite surface at a distance of nine feet from the aperture will be on every side about one inch larger than the aperture, which very nearly corresponds with the angle of the apparent diameter of the sun as seen from the earth.

If the two attributes of extension and duration in space and time are defined as the characteristic modes of existence in the external world, and if we forget or hold as neutral for the moment the human subject, then the phenomenon of light and its propagation would be Goethe's model of the external world whereas matter and gravitation would be correspondingly

Newton's model of it. The former is clearly in the tradition of Plato, giving first priority of perception to the sense of vision, while the second is in the tradition of Aristotle, giving priority of experience to the sense of touch above the other senses in our knowledge of the external world. In the modern European victory of the official scientific revolution over the counter-science of the non-dualist underground, the other self of the European modernity, it was Newton who made the study of light and the study of gravitation or of optics and mechanics separate and different forever; and what he had divided no other man, not even Einstein, has been able yet to put together again.

But in order to be as fair as possible and to bring the discourse and dialogue up to date or at any rate to the mid-twentieth century, one must mention the standpoints of both Einstein and Heisenberg, the latter of whom has directly expressed himself on the Newton versus Goethe issue. Firstly Einstein, as he said, was not a revolutionary nor a radical of discontinuity in modern physics, and had for many years wanted to reconcile the material or mechanistic theory with the field theory or the wave theory, but on strictly Newtonian terms or some development of them. It was to be in the same positivist-dualist tradition which holds that all scientific theories are necessarily either models of reality (nature) or only models of our human knowledge of it, models of truth (culture), and that between the two there must be only degrees of sameness, homogeneity or heterogeneity, as if these were the only two possibilities and their duality were sacrosanct to the exclusion of any third or fourth possibility. He insisted that, insofar as the propositions of mathematics referred to reality, they were not true or certain; and so far as they were true or certain, mathematics did not refer to reality. The Newtonian ambition of Einstein had proved to be impossible of realization time and again in both physics and philosophy. I was thus advised by experts to appeal directly instead to Heisenberg, the pillar of quantum mechanics and the uncertainty principle, complementarity, etc. Alas, I discovered only too soon that he had explicitly opined in 1941 that it is the very self-same unity of Goethe's science of colour, which attempted to cut across apparently separate and different systems of study and domains of nature, physics, chemistry, physiology and

psychology, that is unacceptable to the modern physicist, meaning himself as well as Newton, and for that very reason of seeing unity in variety.

Our conclusion must be that the radical European underground wanted to study the phenomenon respectively of light, the word or the life-breath as being the correlation, the mediation or the unity in the duality of the thing and the sign, the object and the subject, macrocosm and microcosm, the percept and the concept, expressing their mutual relations of competition as well as cooperation, homology, symmetry and complementarity or the dialectics of equivalence, correspondence and reflection. The official European science of modernity was determined from the beginning up to the end never to recognize as 'scientific' any general cosmological theories of the trans-systems unity of matter, life, mind and spirit or of nature and culture or grace. Modern western science and modern western culture as twin children of the European modernity were bound to allow to exist between them only dualistic theories of the unmediated heterogeneity or the equally unmediated homogeneity of such terms as sets of things or signs, the external world and the human mind, which according to Goethe's showing is an altogether untrue, self-alienated and disastrous Faust's choice of the structure of discourse in the projects of science as well as of culture, and from which Goethe and the radical European underground valiantly tried to rescue all of us in the other tradition of Paracelsus and an alternative non-dualist modernity. Thus instead of the science of matter and motion or energy, we have in Goethe the science of light and colours, instead of the search for mensuration, analytical traits and their fixed relations, we have the archetypal phenomenon (*Urphaenomen*) and its metamorphoses or transformations, and instead of explanation in terms of the laws of cause and effect, constants and invariants, which was forgetting the presupposed initial situation and boundary conditions of the system, we have the part and the whole, macrocosm and microcosm, the subject and the object, and the search for the variety of their relations. The purpose for the self is not to know and then conquer, or alternatively to destroy, the world, but to cosmologically unite with it through active reflection in consciousness, lexis and praxis.