occasional infidelities—in eighteenth-century Vienna it would have been amazing if he had not—but he appears never to have contemplated any sort of permanent separation.

For a time, however, the ill-assorted union like everything else appeared to be going well. The letters of Leopold Mozart written during a visit to his son and daughter-in-law in Vienna in 1785 give a vivid picture of the scale on which the young couple were living and the whirl of activity in which they were engaged. A few sentences from one of them serve admirably to sum up the whole:

> We never get to bed before one o'clock. . . . Every day there are concerts; and the whole time is given up to teaching, music, composing and so forth. . . . It is impossible for me to describe the rush and bustle.

One should keep this in mind, especially when one is inclined, as older biographers generally were, to sentimentalize over the hardships and privations that Mozart was to endure later, and to project them backward so that they seem to cover his whole career. He had his moment of triumph, and it was total; aristocracy, general public, and critics—all were at his feet.

IV. DEFEAT AND IMMORTALITY

THE CHANGE in Mozart's fortunes can be conveniently marked by a passage in a letter of May 10-11, 1787, from Leopold Mozart to his daughter:

> Your brother is now living in the Landstrasse no. 224. He does not say why he has moved. Not a word. But unfortunately, I can guess the reason.

From this time until three months before his death, the record is one of steady decline: of moves from cheap lodgings to lodgings cheaper still; of begging letters to friends, some with promises to repay, others simply cast in a tone of desperation; of journeys in search of commissions and returns from concerts which generally ended, in his own words, "in much glory and little profit"; and of steadily worsening health, undoubtedly caused in part by his concern over Constanze's nearly constant illness.

There is evidence that before the date given above affairs had not been as well as they had been formerly. Some months before the letter from which I have just quoted, Mozart had projected a trip to England that had come to nothing, which he would hardly have done if all had been entirely well in Vienna; and from the scale upon which Leopold had found him living in 1785 it seems probable enough that he had been running into debt. Nor was the disaster total when it struck. During the last months of 1787 and the first of 1788 he continued to struggle against his fate, and there was an occasional remission in the decline of his fortunes; *Don Giovanni* had great success in Prague, though perhaps not so great as that of *Figaro;* both these operas were given performances in Vienna, where they excited some interest; he received a court appointment, although at an insultingly small salary; and even in 1789, almost his worst year, a successful production of *Figaro* led the emperor to commission a new opera, the *Così Fan Tutte*. In 1790, however, after the only moderate success of this masterpiece, he seems to have virtually abandoned himself to despair. Saint-Foix lists only eighteen works for 1789, most of them quite small, a number being arias intended for insertion into the operas of other composers, and one the re-orchestration of Handel's *Messiah* commissioned by Van Swieten; for 1790, only about nine, one again being a Handelian re-orchestration.

This comparative unproductivity may be in part explained by mere lack of commissions, but not wholly. For in spite of his desperate need for money, Mozart was finding it hard to complete or even execute such commissions as he received. He complains to his wife of his difficulties with one of the most curious of them, writing a piece for the barrel of a musical clock; and although this composition when finally achieved proved to be one of his great masterpieces, it is saddening to think of his having to put his genius to such uses. Still more in point are his commissions from the King of Prussia. During Mozart's visit to Berlin in 1789 Frederick William had commissioned six string quartets for himself and six easy clavier sonatas for his daughter. Mozart, seemingly with great difficulty, produced three of the quartets, and a strange collection they are—remote, detached, sombre, with minuets that reveal not a spark of gaiety. Of the commissioned easy sonatas only one (K. 576) was completed. It begins innocently enough with a simple, conventional phrase, and then immediately launches into difficulties, both technical and interpretative, that make it one of the most formidable of Mozart's keyboard works, calculated to frighten a Princess of Prussia with limited technical attainments out of her musical wits.

To all appearances the career begun so auspiciously in 1782 had ended. Hopelessly in debt, forgotten by both court and public, in failing health, suffering from a manifest decline in invention, Mozart could seemingly expect no more than a few more years of misery and then oblivion.

NOTHING COULD HAVE DAWNED more bleakly for him than 1791, the year which was to be his last. But within the first week of this year was completed a work far different from those of 1790: his last piano concerto, K. 595 in B flat. Although it was one of the very few concertos published during the composer's lifetime, it remained almost unknown for over a hundred years after his death. After its rediscovery a great deal has been written about it, yet because it occupies a key point in the development of Mozart's style, something must be said about it here.

The first movement relates closely to the manner of 1790. Of it Einstein writes:

> The mood of resignation no longer expresses itself loudly or emphatically; every stirring of energy is rejected or suppressed; and this fact makes all the more uncanny the depths of sadness that are touched in the shadings and modulations of the harmony.

Lest this judgment be thought impressionistic it can be shown that all the Mozartian symbolism of grief is here; the melodies that end almost before they begin, and then seem to resume only with difficulty; the constant tendency to shift from major to minor, and to engage in long wanderings in that more melancholy mode; the frequent use of hollow, empty-sounding combinations; and above all the downward tendency of everything; whenever in this movement a passage rises it does so only that it may descend again. The slow movement is unmistakably a farewell; its opening melody (one of the loveliest that Mozart ever conceived) suggests the phrase that means "adieu" and has reminded many commentators of the opening of Beethoven's "Farewell" sonata; and at the end there is unmistakable symbolism in the reluctance of the piano to quit the stage so that it finally has to be silenced by the orchestra. With the last movement, however, there comes a change. The melody on which the movement is based announces at once a new spirit; although light and delicate it is full of freshness and vigor; though serene it is strong. This vigor the movement never loses; even in the darker sections that are to follow, the rhythmic strength of the motion does not at any time relax. At the very end appear pyrotechnics that recall the great virtuoso concertos of 1786; they are not, however, as Girdlestone would have it, "virtuosity for its own sake," but rather represent a mood of resolute acceptance—the resignation of the first two movements raised to a positive plane. To the hearer the piece is indeed deeply sad; but it is the kind of sadness that one finds often in the eighteenth century—the sad-

ness of optimism: the kind of sadness that underlies, for instance, Pope's famous assertion of optimism:

> Cease, then, nor Order imperfection name;
> Our proper bliss depends on what we blame.
> Know thy own point: this kind, this due degree
> Of blindness, weakness, Heav'n bestows on thee. . . .
> All Nature is but Art unknown to thee;
> All chance direction, which thou canst not see;
> All discord, harmony not understood;
> All partial evil, universal good;
> And spite of Pride, in erring Reason's spite,
> One truth is clear, *Whatever is, is right.*

Mozart has left an eloquent commentary on this concerto, not in words but in the cadenzas he composed for the first and last movements. They bear out in every respect what has been said about the concerto proper. That for the first is full of false starts, fallings away, and turns to the minor, finally fading out almost to inaudibility. That to the last movement, on the contrary, maintains the liveliness of the principal melody almost without a break; when it pauses it does so only to start up again with renewed vigor, leading at last triumphantly though quietly back to the body of the work.

A still more striking departure is the next major work in the canon, the last string quintet (K. 614, in E flat). While there is much weariness and sadness in the concerto, hardly a cloud passes over the radiant landscape of the quintet. One critic has compared the rustling and twittering of the first movement to the awakening of the birds on a spring morning; and indeed if ever a composition deserved the subtitle "Neuer Frühling" (new spring) it is this. The slow movement is serenely cheerful; the minuet full of a sort of out-door freshness, the trio being an idealized bagpipe piece; and the finale, which moves like lightning, of a brusque, almost Haydnish humor. In addition, everything is finished with the most exquisite workmanship, which does not, however, detract in the slightest from the apparent spontaneity of the piece.

WHAT HAS HAPPENED? Obviously, Mozart has succeeded in making a new synthesis: a synthesis which is not only artistic but intellectual and spiritual as well.

The artistic elements that went into this synthesis have been elaborately studied by Saint-Foix, and need not concern us here. We must, however, consider the spiritual element. There is no question that it is connected with Mozart's freemasonry. He had become a Mason before 1787 and remained an active and convinced one until his death. He was not, like his father, widely read or philosophically inclined—how could he be? he did not have the time—and it was through Freemasonry that he became aware of the leading theological and social ideals of the Enlightenment. He whole-heartedly embraced the mysticism which was a part of the Masonic creed, and he found the symbolism of the Masonic ritual most suggestive for his own symbolic art. Above all, in the Masonic ideal of universal brotherhood, he found for his own equalitarianism a safer grounding than he had known before; a basis not of pride or wrath, but of love. One may with Saint-Foix believe that his freemasonry was only a complement to his Catholic orthodoxy—such an attitude was possible at certain times and in certain places in the eighteenth century—or with Einstein that it became in effect a substitute for his older faith; what cannot be denied is that more than anything else it shaped both the form and the content of his later work.

This later work finds its crowning achievement in *The Magic Flute.* With all the deficiencies of its libretto this opera has to stand among the major artistic achievements of mankind. Its two major themes —the freeing of the human spirit from the darkness of ignorance and repression, and the purification of the individual soul, both through the agency of love, are two of the basic patterns of human thought; and by this time Mozart's art was fully ready to present them. It rides serenely over all difficulties, till one is hardly aware that it is art at all; it cannot be called neo-classic or romantic; in its simplicity, richness, and economy it is truly classic.

Its appeal is fully popular. Rejected by the aristocracy, whom he had vainly tried to take by storm, Mozart appeals for justification to the commonalty—and conquers both. Like Shakespeare he appeals to the people's love of buffoonery, of horseplay; like Shakespeare he weaves this element into his web until it becomes one of the most essential strands of all. Without doubt Schikaneder, the librettist-impresario-actor who composed the role of Papageno for himself, saw in it little more than a fine occasion to exercise his considerable talent for low comedy; in Mozart's hands it becomes an essential part of the philosophic structure. Again, the role of the Queen of the Night was designed chiefly to display the flexible throat of Josefa Hofer; when Mozart has finished with it, it becomes a symbol of those forces of repression, which, at first beneficent, at last become the powers of darkness that must be overcome by the children of light.

In *The Magic Flute,* then, Mozart realizes the ideal for which he had been seeking all his life. In it his spiritual and intellectual aspirations find complete expression in an art that knows no difficulties. There is a sort of symbolism in the fact that of Mozart's last two opera commissions one was royal and specified that the work be in a long-dead genre, the *opera seria,* the resultant work being in consequence, in spite of many beauties, now a museum piece; the other, from the manager of a popular theatre, specified a work unlike any that had been composed before, and resulted in *The Magic Flute.*

Very little more than two months after the first production of *The Magic Flute* Mozart was dead. During these last two months he had the pleasure of seeing his last opera, largely owing to the untiring efforts and unflagging confidence of Schikaneder, become a greater popular success than he had ever known before, and his letters testify to the deep satisfaction he felt. In general, however, the narrative of his last days is painful reading, and has been told so often that I shall say little about it here. I shall only observe that it is remarkable that, oppressed by presentiments of death, frightened by physical symptoms which made him believe he had been poisoned, and generally in a state of extreme depression, he was able to complete the magnificent clarinet concerto and fulfill his last commission, the *Requiem,* in such a way that the fragment of this work, although different from the other compositions of this year, is little below them in beauty and power. Owing to the offices of his friend and patron Van Swieten he was not given a regular burial but was thrown into a pauper's grave; and I should like to ask how far the good baron was motivated in this disposition of Mozart's remains by his well-known parsimony, and how far he was consciously performing a symbolic act.

Saint-Foix finds consolation for Mozart's early death in his vast achievement. Turn where-ever you will, he observes, to whatever department of music you please, and at least one of its greatest masterpieces comes from Mozart's pen. I am unable to console myself in this way. With some of the great artists who died early one can feel that death arrived in good time: Schubert, for instance, although his powers had not diminished, was afflicted by an incurable disease[6] which probably would soon have destroyed them; John Keats may very well have expended himself in that one marvelous year which immediately preceded his death. With Mozart, on the contrary, there is no reason to believe that he had not just

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The Filter of Bias And Scientific Investigation

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THE GERM of the idea suggested in the topic of this paper was implanted several years ago when my major professor said one day, "Be careful what you look for because you're apt to find it."

His meaning was obscure to me then and I thought his admonition might be one of the Ozark axioms with which he frequently besprinkled a discussion. Since, however, I have become increasingly appreciative of the rough wisdom of his remark and it has led to a growing awareness of the existence, the influence, and the inherent danger of bias in scientific research.

The Scientific Method is the highest achievement of that evolutionary triumph, the human brain. It probably permeates our thinking and our educational procedures more widely than any other single concept.

THE SCIENTIFIC METHOD

No two of us will agree on a definition of Scientific Method, but, to me, the definition and evaluation of Cohen and Nagel[1] is the most satisfactory one. Scientific Method is the persistent search for truth, constantly asking: Is it so? To what extent is it so? Why is it so?—that is, what general conditions or considerations determine it to be so? From this point of view Scientific Method is simply the way in which we test impressions, opinions, or surmises by examining the best available evidence for and against them. This procedure encourages and develops the utmost possible doubt so that what is left by such doubt is always supported by the best available evidence. As new doubts and new evidence arise, it is the essence of Scientific Method to incorporate them—to make them an integral part of the body of knowledge so far attained. This method, then, makes science progressive because it is never too certain of its results.

Claude Bernard[2] pointed out that the true experimental scientist must maintain an absolute freedom of mind based on philosophic doubt. Then he is free to take his idea, devoid of intuition, systematization, and prejudice to the laboratory and subject it to the ultimate test of the scientific method.

Presumably by such methods we, at least tentatively, derive truths. The disconcerting fact is that we do not derive truths always, or perhaps even very often, by the scientific much less any other method.

Other methods by which we make judgments are those of authority, tenacity, and intuition.[1] These three methods are so fraught with subjective judgment, totalitarian aspects, and inflexibility as to revolt a properly conditioned scientist; yet none of us is able to say honestly that his own use of scientific method has not been abetted or prostituted by authority, tenacity, or intuition.

Thus, it is the thesis of this paper that the application of the scientific method always and inevitably includes a greater or lesser degree of bias and that this bias is capable of and does influence every phase of research from the apperception of the problem to the evaluation of the data to the phraseology of the conclusions. To recognize the existence of such a state of affairs does not alter our faith in the merit of experimental method. It does, however, demand an insistent, rigorous, and unremitting inquiry into the extent and sources of our biases, and the exercise of equally unremitting efforts to exclude them from scientific investigation. As someone has said: "The danger is not in *having* a blind spot but in not *knowing* that one exists."

EXAMPLES OF BIAS

Some examples culled from scientific literature will illustrate the misapplication of scientific method. It was not difficult to find the examples; there was an embarrassment of riches.

A German scientist spent his entire research career working on the physiology, genetics, and behavior of a certain small protozoan. His early work was of excellent quality but, as the structure of his research began to become more complex and his data more perfect, some doubt began to arise in the minds of his fellow scientists—especially when none of them could confirm his results. The proof of one of his suspect hypotheses lay in the inability of some mutant strains of his animals to become motile when a certain hormone-like substance was administered to them. In demonstration before doubting colleagues, the test animals were placed in distilled water, the hormone applied and, true to his assertion, they remained quiescent. The facts were hard to believe but the demonstration was persuasive *until* one young and skeptical observer sampled the bottle of distilled water which was being used as a medium for the nonreactive animals. It was distilled water to be sure, but it contained just a little iodine. Just enough to kill the protozoans and cause them to be very quiet.[3]

IN THE EARLY YEARS of this century, when genetics was a very new field, a distinguished scientist at a major American university "proved" that the variation in the number of spots on the wing-covers of ladybug beetles was genetically controlled. His data satisfied his conclusions and the magnificent color plates which illustrated his publications were very alluring. When some of his specimens were examined, however, the spots seemed to lack permanence and it soon became apparent that he had enriched his raw material with a few artistically placed bits of paint. He was somewhat more gently discredited than his German colleague but nonetheless discredited.

Medical quackery supplies endless examples of ignorance or delusion on the part of the so-called doctor and also of his patients. One distinguished faker was Dr. Albert Abrams of San Francisco who obtained a medical degree from Heidelberg in 1882. He invented, among other fantastic devices, a diagnosing machine called a "dynamizer." To operate this miraculous machine, one wire was run to an electrical source and another attached to the forehead of a healthy person. A drop of blood was obtained from a patient, dried on filter paper, and placed inside the box. Abrams would then tap the abdomen of the *healthy* person who was always—for a reason never

made too clear—facing west and, by listening to the sounds, the doctor was able to diagnose the ills of the patient who supplied the blood sample. Abrams manufactured his machines in quantity and leased them to subsidiary quacks who then were able to diagnose as well as did Abrams. The doubting American Medical Association once sent a blood sample for diagnosis to an Abrams practitioner in Albuquerque. The blood sample was from a healthy male guinea pig who was identified to the practitioner only as "Miss Bell." The A. M. A. received a prompt reply saying that Miss Bell had cancer to the amount of six ohms, an infection of the left frontal sinus, and a streptococcic infection of her left Fallopian tube.[4]

Upton Sinclair was a patient of Dr. Abrams and rose staunchly to his support when he was accused of deliberate deception. Sinclair defended Abrams' dubious contributions to medicine with a statement which epitomizes the bias of every self-deluded crank, "I have known many scientists, but never one . . . *more passionately convinced of the truth of his teachings*" (italics mine).

The next illustration I want to use was told by one of America's most eminent physiologists. I can do no better than to tell it in his own words:

> In a biochemical journal of the mid-20's was published an article in all the formal panoply and dignity of a careful report of scientific research. The objective was given—to discover the religious conviction of cockroaches. The method was very simple. One hundred roaches were put into the center of a tube one meter long, with a cross at one end and a crescent at the other. Then a Bunsen burner was put under the middle. The hypothesis was that, in time of dire peril, an individual will follow his deepest convictions. Results were presented with extensive tables of data and full statistical analysis. The conclusions were clear: 49% of the roaches were Christian and turned to the cross, 48% were Mohammedan and ran to the crescent, but 3% were Atheist and died where they stood, rather than acknowledge any religion.[5]

The foregoing examples illustrate errors of deliberate deception or of clear stupidity, understandable yet unforgivable.

Other errors, more clearly attributable to bias, may be *almost—almost* forgiven.

Such an error is that of Smith Woodward who, in 1912, reported to the Geological Society of London his observations and conclusions concerning some fossils which had been sent to the Natural History Museum in London. He concluded that they were a part of the head of a fossil ancestor of man he named *Eoanthropus*, the *Dawn Man*, better known now as Piltdown Man. Eoanthropus fitted uncomfortably into the other evidence for the descent of man, but many authorities had expected to find such a man. Arguments raged pro and con, some scientists insisting that this was, indeed, a fossil man whose existence would have to be reckoned with in the theory of the evolution of man; others insisting that the fossils were simply a human brain case and an ape jaw lying near each other by coincidence. In 1949 a newly discovered method of dating fossils by measurement of the amount of fluorine in them dealt a severe blow to Piltdown Man. He was too young to fit into the scheme in the position assigned to him. This single incertitude led to the perfection of new techniques to search further into Piltdown Man's small remains. By use of these techniques it was demonstrated clearly that the Piltdown fossils were actually a human skull and an ape jaw, cleverly disguised and modified and deliberately planted by some inspired practical joker.[6] Woodward's fiercely held convictions were all wrong. Yet with the techniques available to him and in the state of development of anthropological theory at that time, they were justified.

Taking an example from the history of chemistry, the Phlogiston Theory reveals clearly the extent to which erroneous conclusions can be reached in the dawn of experimentation when theories are born. It is even more interesting to recall that subsequent investigation, new techniques, different intellects, finally prevailed to a different, more staisfactory, and more accurate theory to explain oxidation and reduction.

DEEP-ROOTED cultural and social biases profoundly influence the interpretation of scientific results, and this is seldom more evident than in the conclusions involving the physiological effects of alcohol in human beings. Two popular physiology texts written at approximately the same level, published within five years of each other, both authored by men of European birth to whom the same experimental studies must have been available, make these comments concerning alcohol. The first one states: "Studies upon man and laboratory animals ingesting moderately large quantities of alcohol over long periods of time fail to show conclusively that there are serious deleterious effects on body organs, longevity or reproduction. . . . Perhaps the most important problem in the field is that presented by the excessive use of alcohol by some people who are unable to control the amount they drink and become alcohol addicts or "Alcoholics" . . . Certainly the person who consistently seeks refuge from the trials of life in the euphoria of alcoholic intoxication creates a vicious cycle difficult to break. Life becomes increasingly exacting, because drunkenness lowers his efficiency and therefore multiplies the troubles from which he must seek to escape."[7] This author is known to be an abstainer and has devoted great effort as well as financial support to the rehabilitation of alcoholics. The other author gives much the same evidence for the action of alcohol and concludes his treatment with: "Is alcohol harmful? On the basis of centuries of experience it appears quite probable that a moderate amount of alcohol may be taken daily as part of a mixed diet without any injurious effect. In this connection it is interesting to recall that the cradle of Western civilization is the Mediterranean basin, where the consumption of wine has been extremely large for millenia. Yet nowhere on the globe has so much been accomplished for human culture as in the Mediterranean area, where Moses, Christ, Plato, Phidias, Dante, Michelangelo, Columbus and Galileo lived, worked and died."[8] The second author is not known to the writer but it is apparent, from the color of his statement, that he is not averse to the use of alcohol. (In fact, he recommends moderate use of alcohol for the convalescent, the traveller, the radio listener but proscribes it for mountain climbers, locomotive engineers, or radio-control directors.)

Cultural and social bias have also laid their imprint upon both the structuring and the conclusions of experimentation designed to determine the similarities and differences between races. One such exam-

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ple involved an anthropometric and psychological study of different races. The authors, realizing the extent to which different socio-economic environments could affect the results of such a study, carefully chose Jamaica for the site of the investigation because they felt, in that country, they could find whites and negroes with more nearly comparable environments. To determine comparative intelligence the authors used the Army Alpha test which consists of eight parts. The negro scores were higher in exactly half the eight parts of the test, lower in the other half. It is obvious that the results afford no support for the doctrine that either race is superior or inferior to the other one. Nonetheless, the authors, both of whom were competent scientists of excellent repute, were able, by an almost incomprehensible feat of mental legerdemain, to read into these very results interpretations confirming their evident prejudices. The conclusion from these figures is:

> The Blacks seem to do better in simple mental arithmetic and with numerical series than do the Whites . . . It seems a plausible hypothesis for which there is considerable support, that the more complicated a brain, the more numerous its association fibres, the less satisfactorily it performs the simple numerical problems which a calculating machine does so quickly and accurately.[9]

In short, although these tests were designed and standardized as intelligence tests, the authors pick out the ones in which the Negroes excel, and *then* decide that higher grades of intelligence are associated with *lower* rather than with *higher* scores on these particular test items.

Overenthusiasm is a state of mind which contributes readily to bias. The school of psychologists who believe firmly in the phenomena of Extrasensory Perception and Parakinesis are thought by some to have permitted bias to enter into their work. The fact that they have explained both their successes and their failures by postulating hitherto undescribed and unproven capacities of the human mind, leaves the conservative mind in a state of dubiety mixed with admiration for so imaginative a solution to the dilemma.[10]

As a further example of overenthusiasm there is the "bandwagon effect" which follows a new and exciting discovery. Following the advent of Adrenocorticotrophic Hormone (ACTH) into the clinical world there was a veritable fountain of publications "proving" that it could and did cure or ameliorate all manner of ailments. This situation became so intolerable to serious and conservative medical men that their sardonic definition of ACTH became "After Cortisone Try Hadacol." This surly point of view was probably no more justified than the exuberant attitudes of those who rode the bandwagon.

Finally, bias can cause an experimenter to ask a question wrongly. If his preconceived notions are strong and he deduces his conclusions before he does the experiment, he is apt to ask a question which may give him an equivocal answer or no answer at all. As Dr. Laurence Snyder has said, "It is not a crime against science to ask a nonsensical question . . . The crime against science is committed when, having failed to get consistent or unambiguous answers from nature, we fail to alter our question, or even radically to reframe it. If we do not take this step, we fail in one of the most important steps of the scientific method.[11] A venerable story will serve to illustrate this point. A temperance lecturer concluded his exhortation on the evils of alcohol by dramatically dropping one worm into a glass of water, another into a glass of whisky. The worm in the alcohol writhed piteously and died, whereupon the lecturer turned triumphantly to a small boy in the front row and cried, "What does this prove to you?" After a moment's reflection the small boy replied, "Well, it proves that if you drink whisky you'll never have worms."

THE INGREDIENTS OF BIAS

Having established that various factors of that which the psychologists term the "personal equation" can profoundly influence the conclusions derived from scientific investigation, it is proper to enquire, at least superficially, into some ingredients of bias.

Self-interest, prejudice, and vanity are all a part of ego-involvement which can and does distort the planning and interpretation of investigation. Yet ego-involvement remains an important or even an essential component of scientific research. As Edwin Boring puts it, "out of egoism are derived the desire and enthusiasm that lead men to undertake research, to keep at it, to publish the results, to keep promoting the knowledge and use of these results."[12]

Neurotic tendencies or unresolved anxieties ranging from "quirks" to near-psychoses may not only distort the creative drive of a scientist but color his judgment of results. Kubie cites the case of a scientist who had proved his case but was driven by anxieties to augment his proof by falsification of data.[13]

The desire of the average person to conform may seriously limit the originality requisite for good research. Scientists, as much or more so than any other group, operate in a *Zeitgeist* or climate of opinion which inevitably influences the nature of their inquiries and circumscribes the tone of their theories. For example, in this country it is generally held that the pineal body has no function and relevant research in America is sparse, while in South America and Britain the attitude is that the function of the pineal has not yet been discovered and research burgeons. The effects of *Zeitgeist* are beneficial, too. It tends to restrain the more imaginative scientist and suggest channels of effort to the less imaginative. It makes scientific progress slower, more cautious, but it also makes it surer.

A final element of bias to which I shall refer is Loyalty. "The student mirrors the master" and thus little *Zeitgeister* spring up wherever there are strong leaders or well established schools of thought.[13] The same advantages and disadvantages of the entire *Zeitgeist* also apply here.

CONCLUSION

In the preceding paragraphs an attempt has been made to outline not a cynical but a realistic portrait of some of the abuses to which experimental method is subjected. No better method than this has presented itself for the establishment of truths, nor perhaps is apt to. If one believes in the value, more so in the stark necessity of the best, the most accurate, the finest employment of scientific method if our civilization is to endure, how then can we honestly and intelligently try to improve its admittedly faulty application?

Firstly, continued and improved communication must be ensured. Knowledge can grow and persist only in a system of free exchange of ideas, techniques and of mutual criticism. In such a climate, bias is subject to the controlling action of confirmation, discussion, and similar experimentation.

Secondly, through diligent and continuing self-analysis we may come to understand our own limitations and more completely free ourselves and our work from the filter of bias. Perhaps more importantly, we may then better fulfill our functions as teachers by distilling and refining the appreciation and application of scientific method which we transmit to our students.

If some of our biases were inculcated, as they no doubt were, during our training as users of scientific method, can we then improve the preparation of our own students? A popular conception exists that scientists are precisely functioning, coldly logical planners and measurers who proceed methodically from hypothesis to fact to theory. This is, to speak most kindly, a figment, for the scientist is not a being with a different intelligence than any man

or every man. His approach to problems is the result of training and it is to training that we may look to reduce the bias which at best dilutes and, at worst, obverts the intrinsic perfection of scientific method.

"If men can be taught to follow and emulate false prophets, if they can be made to sacrifice their lives for false doctrines and ideals they can also, among free people, be inspired to seek new truths and can be taught the techniques and attitudes which are appropriate for the discovery of truths."[14]

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Mozart . . .

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arrived at his full powers. His whole life story is of a struggle to realize an idea of style in which to express fully himself and his century; and by 1791 he had realized it.

It is distressing to remind ourselves that had Mozart lived ten, even five years longer, he would undoubtedly have received a libretto from Johann Wolfgang von Goethe. Goethe was already interested in Mozart himself and in *The Magic Flute;* great poet and critic that he was, he saw through the many weaknesses of that libretto to the eternal value of the total work. Mozart had already shown what he could do with a text by Goethe in one of the finest of his songs, *Das Veilchen.* What would have been the result of that collaboration? We can only wish we knew.

V. THE STYLE AND THE MAN

WE HAVE NOW FOLLOWED—sketchily, it is true, but in as much detail as space has permitted—Mozart's career from its beginning to its untimely end. From this sketch we can see that the only significance of the events of his life is as they relate to his genius. After his early travels his career was uneventful, except as any artist's is eventful, in artistic triumphs and failures.

This life was unified and made coherent by a theory of style. More fortunate than many other great geniuses, Mozart early acquired a concept of style from which he was never forced to depart. Even in his one rather brief aberration, under the influence of *Sturm und Drang,* he did not wander far. Although he left no developed aesthetic theory, there is no question that he had one, certainly for music and probably for other arts as well. His musical aesthetics can, with the help of *A Musical Joke,* be readily reconstructed from his letters.

The keynote is the word "natural," which runs like a *leit motif* through his correspondence with his father. The most damning thing he can say of a composer is that he is not "natural"; his greatest praise is the reverse. And fortunately in a century when this word meant many things to many people we have a clear statement of what it meant to him, in one of the most precious of his letters. Describing to his father how he portrays the rage of Osmin in *Die Entführung* he writes:

> For just as a man in such a towering rage oversteps all the bounds of order, moderation, and propriety, and completely forgets himself, so must the music too forget itself. But as the passions, whether violent or not, must never be expressed in such a way as to excite disgust, and as music, even in the most terrible situations, must never offend the ear, but must please the hearer, or in other words must never cease to be *music,* I have gone from F (the key in which the aria is written), not into a remote key, but into a related one, not, however, into its nearest relative D minor, but into the more remote A minor.[7]

A great deal can be deduced from this short passage. Very briefly, then the *natural* expresses the emotions with maximum intensity, but always within the bounds of the given art. And that art must remain unobtrusive, so that the hearer may not be shocked or startled in such a way as to distract his attention from what is represented.

This states, briefly but more or less adequately, I believe, the principle of style that Mozart carried with him all his life. The test of any theory of art is whether it will stand up under long wear; Mozart's did. As he grew older, what he had to convey grew always richer; but his theory of communication required no change. That theory is, as anyone can see, classic; but in the music of his last year, when for the first time his ideals were fully realized, such terms as "classic," "romantic," and the like, became insignificant. Writing of the last piano concerto Einstein has said, "It is so perfect that the question of style has become meaningless." Matter and manner, form and content, style and man, have attained that perfect fusion which can be achieved only by the greatest art—the kind of art without which no artist can be wholly natural.

FOOTNOTES

[1] The finale of the B-flat piano concerto, K. 595, provides a charming example of this sort of wit. As the rhapsodic and somewhat stormy development is drawing to its close, the piano impatiently signals that it is time for it to take up the principal subject again (p. 61, third score). The orchestra assents, and after a brief cadenza, the piano does so, but in the wrong key, E flat instead of B flat (p. 62, second score). In the middle of its second phrase the orchestra tactfully reminds it that it has made a mistake (third score). The piano hesitates, seems to become confused, and engages in nearly a page of rather aimless (only apparently aimless, of course) wandering. Finally, with an air of relief it settles on the transitional phrase which leads to the second subject. By this highly witty procedure, Mozart accomplishes several ends: he avoids the repetition of the principal subject, reserving it for its very effective entrance just before the close; he gains suspense—for several measures the hearer does not know exactly what to expect; and he gives us a taste of his beautiful main melody in a key in which it sounds more ethereally lovely than it ever has before. The suspense is added to by the fact that E flat (the subdominant) would be a possible key in which to begin the recapitulation, although somewhat archaic; Mozart himself had used it not long before in the little piano sonata in C, K. 545. (My references to the concerto are to the two-piano score published by G. Schirmer, as readily accessible.)

[2] Cf. Saint-Foix, IV, 231, "ce morceau est presque un concerto pour la voix et le piano, accompagnées par l'orchestre!"

[3] E. J. Dent, *Mozart's Operas,* 2nd edition (Oxford, 1947), 94.

[4] Anderson, II, 555-6.

[5] After her marriage to the banker Nissen, Constanze developed into a shrewd and not over-scrupulous business woman.

[6] I believe that O. E. Deutsch has offered conclusive proof of this.

[7] Anderson, III, 1144. The whole letter is extremely interesting.