III. CLEARNESS

The notion prevails that writing is a knack, that the skilful use of the pen is a gift of nature. This is an error. Dogberry may be responsible for it; he said: "To be a well-informed man is the gift of fortune, but to write and read comes by nature". Because Dogberry said it, we may be sure that Shakespeare thought otherwise. Ability of any sort may be partly innate, but my own observation and experience lead me to conclude that most of the easy writers have become so by constant practice. As I recall the names of men successful with the pen, I remember that most of them have written a great deal and have taken particular pains to improve their style. The suggestion that proficiency in the difficult art is a happy accident provokes a sardonic smile. The larger part of the great writing in our literature is the result of persistent effort. An easy fluency has been the undoing of many; their flamboyant and fantastic scribbling has proved as perishable as froth.

This criticism applies to technical writing also; in order that a technical description or discussion may hold the interest of the reader, at least long enough to cause him to read it to the end, the writing must be done carefully and systematically; otherwise it will fail in its purpose of conveying information. Clearness is absolutely essential. "It is not enough to use language that *may* be understood; it is necessary to use language that *must* be understood."*

The purpose of writing, at least of that which is meant to be read by others, is not only to express ideas but to communicate them. Lack of perspicuity may prove as bad as

* Quoted by Hill from Quintilian.

untruthfulness. J. H. Finley, in his preface to George Crabb's 'English Synonyms', says advisedly: "For there be three classes of men who do not tell the truth except by accident; first, those who do not know it; second, those who wish not to tell it; and third, those who do not know how to tell it".

From first to last, REMEMBER THE READER: that is a rule never to be forgotten in any kind of writing except the diary. The diarist can shoot his words into the air; yours are aimed at the intelligence of a sympathetic human being. Consider him; if you do, you will escape half the pitfalls awaiting you.

Clearness of statement depends, first, on the choice of words; next, on the order in which they are arranged; then, on the sequence of clauses composing a sentence; and, finally, on the arrangement of sentences in a paragraph.

Select the word that is appropriate to your thought: the word that pertains to the thing described.

Food is wholesome; climate is healthful; a person is healthy.

A foundation is permanent; an orebody is persistent.

A climate is equable; a contract is equitable.

Judgment is held in suspense; sediment, in suspension.

A problem is unsolvable; a mineral, insoluble.

The force of steam was discovered; the steamboat was invented.

We measure distance in linear feet, but pedigree by lineal descent.

Good writing depends not so much upon a large vocabulary as upon the choice of words. The wrong word derails the thought; the needless word is an obstruction. A writer that flings needless words about him is like a swimmer that splashes; neither makes speed. The blue pencil of the editor is the symbol of excision because we recognize that it removes the useless members of the literary structure. Revision commonly denotes pruning. The dominant fault of the incapable writer is the employment of too many words. Even practised writers err in this respect; for example, H. G. Wells is fond of doubling his adjectives, thus:

In the preceding chapters there has been developed, in a **clumsy, laborious way,** a **smudgy, imperfect** picture.

More than one adjective may be needed to describe an object, but each adjective should convey a distinct meaning. Whether the adjectives in "smudgy, imperfect picture" overlap may be questioned. Probably if Mr. Wells had omitted "laborious" and "smudgy", he would have said as much; and more pleasantly. The proper use of adjectives and the use of proper adjectives can be studied profitably by any writer, however experienced.

Verbosity is a sign either of carelessness or of lack of time for care. Pliny wrote to a friend, nearly 1900 years ago, "I have not time to write you a short letter, therefore I have written you a long one".

On the other hand, the effort to compress may be carried too far. Not long ago the editor of a British paper had to shorten a story to fit a given space and he had to do it in a hurry; so the last few paragraphs were condensed into a single sentence, which ran thus:

The Earl took a Scotch high-ball, his hat, his departure, no notice of his pursuers, a revolver out of his hip-pocket, and, finally, his life.

Here is an example from a technical article:

They can distinguish in their own work between the lucky guess and the well-planned technical achievement.

One does not compare two things so essentially unlike as a guess and an achievement; the writer has omitted three necessary words, thus:

"They can distinguish in their own work between *the result of* a lucky guess and the well-planned achievement".

Avoid words you do not know fore and aft. Do not be tempted into the use of high-sounding terms that frequently are employed to cover ignorance. Comprehensive words like 'development' and 'evolution' are often mere noise and smoke, not penetrating shot. As the old lady was grateful for "that blessed word 'Mesopotamia'", so that comfortable word

'metasomatic' has cloaked many nebulous notions of ore deposition. Likewise 'dynamic' is sadly overworked by perplexed geologists.

The **dynamic** power that shattered the mountains and created fissures in which the ore is now found.

So far as is indicated, the "power" might have been dynamite. It is amusing to recall how Ruskin twitted Tyndall for a similar indiscretion. Tyndall had referred to a certain theory, which was in debate, affirming that it, and the like of it, was a "dynamic power which operates against intellectual stagnation". Whereupon Ruskin commented thus: "How a dynamic power differs from an undynamic one, and, presumably, also, a potestatic dynamis from an unpotestatic one—and how much more scientific it is to say, instead of—that our spoon stirs our porridge—that it 'operates against the stagnation of our porridge', Professor Tyndall trusts the reader to recognize with admiration".

If you do not know how to characterize something you have seen, do not imagine you have done your duty when you have labeled it a 'phenomenon'. That is a generic term conveying to the scientific mind the idea of an observed fact, especially with relation to what is subject to change, as opposed to the essence of things; in a loose and popular acceptation it carries an impression of the unfamiliar; in either case the label 'phenomenon' explains nothing. Macaulay said: "I have often observed that a fine Greek compound is an excellent substitute for a reason".

In a recent controversy * a clever technician had much to say about "orogenic" when discussing the source of ore in veins. He made bold to play with it for awhile, but Greek terms, like razors, are not to be flourished recklessly. He had to be told that ὄρος means mountain and that 'orogenic' relates to mountain-making, not to the genesis of ore. Be warned therefore: know what a word denotes before you use it.

* Trans. Inst. M. & M., London, Vol. XXIV, p. 178.

In a recent issue of the 'Atlantic Monthly' I read this:

Authors are like miners: they put the precious metal into their books; but when one gets to the mine, there is apt to be a lot of 'slag' about!

The exclamation mark is well placed. The simile is confused. Apparently the idea is that as authors put precious things into their books, so miners put precious metal into their mines; but when one reads the book one finds a good deal of piffle scattered over the pages and when one goes to the mine one finds heaps of slag. The comparison might hold true if miners made slag at the mine; they do not; the slag is the refuse from smelting, an operation that is usually performed far from the mine. For "slag" read 'rock'. Part of the slag in the 'Atlantic' quotation is the word "apt", which is out of place. 'Apt' means 'suitable' or 'appropriate'; it is not a correct synonym for 'likely'.

The rule is to use the word that will be understood by the reader and that at the same time best expresses the meaning. "Too many cooks spoil the broth" is a simple statement, which 'Punch' transformed jocularly into "A superfluity of culinary assistance is apt to exercise a detrimental effect upon the *consommé*". That is the language of a newspaper reporter.

Avoid using words of similar sound but of different meaning in the same context.

When preparing this lecture I wrote:

By the **way**, I must ask you not to **weigh** the value of my admonitions entirely by the manner in which they are conveyed to you.

Noticing the similar sound of "way" and "weigh", I deleted the introductory clause.

In the 'Atlantic Monthly' again, I find:

But the cathedral is the gem of the **scene**, having the most beautiful nave I have ever **seen**.

An engineer writes about the shipment of machinery to the Philippine Islands:

A copy of the packing list should be included in each **case** or attached to each bundle.

Here "case" is a packing-case, but it might be mistaken for the common abstract phrase 'in each case'.

The main whistle answers with two long **blasts,** thus notifying all the men on the hill that the **blasting** is over.

Substitute 'toots' for "blasts". The 'blasting' refers to the explosions of dynamite used in breaking ore.

The requirement from the **management** [managers] of reports to stockholders, giving a detailed account of their stewardship, will **be corrective of** [correct] many of the abuses of **management** [corporate responsibility].

Here "management" is used in two different senses.

The proportion of the rainfall that sinks into the ground **naturally** varies according to the character of the underlying rocks. But, whatsoever the **nature** of the rocks may be, they are . . .

This was written by a geologist pre-eminent for good writing —James Geikie. The "naturally" does not refer to 'nature', it means 'obviously' or 'necessarily'.

A hydrographer writes:

This is **well** illustrated by **well** records.

A metallurgist remarks:

The first light on **the solution of** the problem was the discovery that the gold was **soluble** in a **solution of** an alkaline mono-sulphide.

The first phrase in black type can be deleted; and to prevent the awkwardness of using 'soluble' with 'solution' it would be an agreeable change to write that "the gold dissolves in a solution of an alkaline mono-sulphide".

The problem is not simple. The best **solution** would be to roast the ore carefully, forming a silver sulphate, which is **soluble** in hot water.

When writing concerning a chemical solution, do not refer in the same paragraph to the solution of the problem; likewise, when writing on geology, do not in the same context refer to the rock formation and to the formation of the ore deposit. The use of a word in different senses causes confusion of thought.

The principal **formation** in the district has been mentioned. The shale evidently has played no part in the **formation** [deposition] of the ore **deposits.**

The guides were held so strongly by the heavy mass of **unset** [moist] concrete that the jar from passing skips only **settled** [fixed] them more firmly into place, and the initial **set** [of timber] was not broken.

He may mean the 'set', or hardening, of the cement, but as he is writing concerning shaft-work, he may be referring to a 'set', or structure of timber; therefore he should insert 'of the concrete' or 'of timber', to explain. The use of 'unset', 'settled', and 'set' in the same context is bewildering.

This spherical shape can be maintained **only** if the pressure on the inside is greater than without. Surface-tension **only** can account for this excess.

Here 'only' is used twice and with different meanings. The second one should be replaced by 'alone'. The first sentence can be improved thus:

"The spherical shape can not be maintained unless the pressure . . ."

To illustrate the terrors of careless writing in technology I quote the following reference to machine-shop design:

To ensure accuracy in cores set in drop points, it is well to make a special core box, which will fill up the point impressions over the core, as well as core [here a verb] the actual hole, and to see that the dimensions of points and core coincide exactly, thus leaving the molder nothing but to insert the core.

Let us hope that the molder has no feelings!

A loose **knot** is one **not** held firmly in place.
The **ore, or** the vein itself even, is hard to trace.
This machine is preferable **for** the **four** reasons already indicated.

Oliver Wendell Holmes said: "People that make puns are like wanton boys that put coppers on the railroad-tracks".

When you use a word that has more than one meaning, make clear the sense in which you are using it, by the context or by an explanation. Of two words that may be employed in the same sense, select the one susceptible of a single interpretation.

He prepared a **partial** account of the events that preceded the strike.

Was his account prejudiced or was it only incomplete?

This required **the partial** [part of the] time of a man who might be **using this time** [employed] to better advantage.

Sometimes **partially** [partly] formed pyrite crystals have barite between them, and the galena crystals are **partial** [incomplete] and enclose some barite.

The 'New Republic' says:

In order to justify the sternness of the protest the case itself should be at least **partially** established.

Cases may be established partially, that is, with partiality. The editor meant 'in part' or 'partly'.

The work described herein forms part of **a partially completed** [an uncompleted] study of sulphur dioxide.

A 'partially' completed work may be one that is complete in part or one that is generally unfinished.

John W. Smith, the **late** manager of the Wild-Cat mine, was unable to make it pay.

Is Mr. Smith dead? Was he the former or was he the deceased manager? Or was he merely unpunctual? If he was alive when the sentence was written—and he was—he should have been described as "lately [or recently] the manager".

The geologists can help by reporting the **localities** [places] in the mine where water is going to waste.

He used "localities" because it has a bigger sound; it is vague, whereas he needs to be definite in his statement.

A pair of analytical balances

It is the pair of pans hanging at the ends of the lever that constitute the balance. He says, but does not mean, two balances. This reminds me that 'balance' is used frequently and improperly for 'remainder'; thus:

Ten centimetres of the wire was used for the test; the **balance** [remainder] was thrown away.

Two hundred of the men left the mine, the **balance** [others] continued at work.

'Balance' primarily refers to a condition of equilibrium, to a state of neutrality or equalization. It is well to use words in their primary sense.

Distinguish between 'farther' and 'further'; the first should be used when referring to physical distance, the latter to the metaphorical.

At Brest, where France projects **furthest** [farthest] west.
We were unable to go **further** [farther] toward the summit.
To proceed **farther** [further] with this policy would be a mistake.
The **farther** [further] he went with his experiments, the more confident he became.

The meaning is made clear by using the right adjective, that is, the one that belongs to the idea to be expressed.

The admixture of salt in roasting led to a **lower** [cleaner] residue.

He means the leaving of a residue containing less of the metal he was trying to extract.

He gets **greater** production and better **production** for each dollar invested in labor.

He means "a larger production and a better product".

This time might easily extend to as **high** [long] as ten days.

The idea of extension here involves length, not height.

The ore was poor at surface, and even **worse** [poorer] on the second level, but it is **distinctly good** [rich] on the third.

'Rich' and 'poor', 'good' and 'bad', 'high' and 'low' are the correct antonyms.

The return was small, because the capital was **high** [large].
This method is as **perfect** [good] as any other.
I have had the chance to see the results of both good and **poor** [bad] packing.
The crude ore is not as good, but the concentrate is no **lower** [better], because it is cleaner.

"The crude ore is poorer, but the concentrate continues to be as rich, because it is cleaner."

To find the type of institutions best calculated to help the better and repress the **pernicious** [worse] tendencies is the task of the philosophic enquirer.

So says Bryce. The use of "pernicious" instead of 'worse' spoils the force of contrast with "better".

The choice of the right adverbial phrase is important, thus:

The iron rods were heated to such **an extent** [a degree] that the brazing was destroyed.

The yield of gold on the plane of the vein had been $4 per square foot **over** [more than] the reduction cost.

The use of a noun as a verb may be a colloquial error, as in:

Two men **coal** the shovel quickly.

It looks like an interchange—a slip of the pen; he must mean "shovel the coal", you say. No, he means supplying coal to the boiler of a steam-shovel.

The failure to repeat a necessary word may obscure the sense.

Wages at the leading mines of the country have been cut from 15 to 17%. This is far below the reduction in other lines of industry.

The word "cut" should be repeated after "this" in order to make the statement clear. Moreover, the cut was not "from 15 to 17%", it was from some amount to some less amount, say, from $5 to $4.20. "From" should be omitted. He means:

"The wages paid at the principal mines of the country have been cut 15 to 17%; this cut is less than that made in other branches of industry."

Avoid needless indirection, as by using a double negative.

The details of the methods used abroad are **not unknown** to American chemists.

He proceeds to state that they are known thoroughly.

They restrict the performance of the work to certain methods which are **not inconsistent** with economy.

"They restrict themselves to methods that are consistent with economy."

The **inefficiency** [efficiency] of labor at these mines has **increased** [decreased] very little.

The affirmative is preferable to the indirect negative, for example:

In this part of Mexico the vitreous type of rhyolite is **not uncommon** [common].

The choice of the right article is important.

Reduce the loss in the residue to **a** [the] minimum.

He said 'a' as an elegant variation on 'the', which he had used twice just before, but the use of 'a' before minimum suggests that he did not know what was *the* minimum attainable. This is a common blunder. I quote two more examples:

The annual rainfall **averages** less than five inches as **a** [the] maximum.

He is speaking of a desert country and probably means that the average rainfall rarely exceeds five inches per annum.

With the use of **a** [the] maximum amount of water

It were better to state the quantity of water.

I used **a** process in which manganese oxide serves as purifier of the electrolyte.

He means: "I used the process in which manganese oxide is used to purify the electrolyte". It was a particular process, well known to those interested in the subject—that of refining zinc.

He used **the** method that he had learned while at Broken Hill, in Australia.

The 'method' is not explained or described; it remains 'a method'; therefore 'a' should replace "the"; otherwise his readers are likely to be puzzled.

As a result they have very few breakages or losses **occur to their goods.**

He has been describing an efficient method of packing, *the* logical result (not *a* result) of which is to prevent breakages. As to the fewness, that is a matter of opinion, based upon experience. He means to say:

"In consequence they have few breakages or losses."

Do not confuse time with place. For example:

The ore **sometimes** [in places] has a distinctly banded structure.

Such ore deposits are of **frequent occurrence** [numerous or of common occurrence] in Nevada.

This kind of ore is **frequently met with** in Colorado.

One does not "meet with" ore either once or many times; the sentence should read:

"This kind of ore is found in many mines in Colorado."

Meta-cinnabarite is not a **very** common mineral, and **when** [where] it **does occur** [is found] there is usually some cinnabar **with it.**

Delete "very" and "with it", thus placing "cinnabar" and "meta-cinnabar" in emphatic positions at the end and the beginning, respectively, of the sentence.

The pyrite outcrop is **always** [everywhere] oxidized.

[Some of] These crystals are **sometimes** as much as an inch in diameter.

Richer ore is invariably found **when** [where] the lodes are in the sandstone.

At times [In places] the vein pinches to a mere thread.

The vein **when** [where] it is thickest breaks into small stringers.

This method cannot be recommended **when** [if] applied to slime.

The idea of time is not involved. He means:

"This method cannot be recommended for the treatment of slime."

The correct adverbial phrase is descriptive, it evokes the right image and thereby fulfils the purpose of language.

This coal has been measured **in several instances** [at several points or in several places].

True conglomerate was observed **on rare occasions** [rarely or at points widely separated].

Only **part of the time** [in places] will erosion expose the formation for our study.

The formation in which the deposits occur is hornblende-schist, which near the surface is **often** [in several places] altered to chlorite-schist.

The introductory clause is not commendable; he is speaking of one ore deposit; he used the plural unnecessarily, and employs that tiresome word 'occur'. He means to say that the 'ore-bearing rock', or the 'rock enclosing the ore deposit', is hornblende-schist.

In fitting one piece to another, common calipers are **frequently** used.

They are not used "frequently"; he means that they are in common use or are commonly used.

When [where] the cost of sulphuric acid is high, and where the quantity of shale to be retorted is small, **then** [there] **and in such case** it is possible that the probable financial results would not warrant the expenditure of capital required to construct the plant for the manufacture of the ammonium sulphate.

It is not a question of time but of place; he is referring to the exploitation of shale in remote localities. "And in such case" is redundant; it is a mere frill. So also are the words "it is possible that". He means that *where* sundry conditions prevail *there* "the probable financial result might not warrant the expenditure".

The intelligent use of the common adverbs is a great help to clearness of expression, and I venture to emphasize it with further quotations from manuscripts that I have revised. Here are five in which 'where' is employed in place of a more suitable adverbial phrase:

Mr. Tucker quotes from an English novel **where** [in which] a peer of the realm speaks . . .

These formulæ are applicable to the case **where** [in which] one concentrate only is made.

'Case' is a vacuous word; he means 'process'.

I have come across several instances **where** [in which] the presence of zinc was detrimental.

Any business **where** [in which] the element of chance is unavoidable.

When the percentage of copper diminished to a point **where** [at which] the ores could not be profitably smelted.

This can be improved in several ways, thus:

"When the copper content fell so low that the ore could not be smelted profitably."

The geologist **located** non-magnetic bodies of iron ore **when** [where] these bodies **occupied** [bore] a **certain** definite relation to magnetic beds **which** [that] were themselves too lean in magnetite to constitute ore.

One 'locates' a claim, but 'finds' or 'discovers' an ore deposit. "Certain" is redundant.

The rich veins diminish **often** in richness as depth is gained.

If they diminish "often" they must soon be done to a frazzle. It does not require a Byzantine logothete * to inform the student that the adverb must be put as near as possible to the word it modifies. Here "often" modifies "diminish", and it might precede that verb; but, more truly, "often" modifies the whole statement, and it would be better to say, "Often the veins diminish in richness as depth is gained". However he does not mean "often"; he means that 'many' or 'most' of the veins become impoverished with increase of depth, and he ought to say so. As the stage reeled close to the edge of the precipice the timid passenger asked the driver, "Do people *often* fall over the edge here?", "No", said the driver, "only once."

These rocks are **nearly always** red.

"Most of these rocks are red,"

These pebbles are **almost never** striated.

"Few of these pebbles are striated", or "Only a few of the pebbles are striated".

The rock contains **much** altered plagioclase.

* One of my critics objected to this, because he failed to note that the use of "done to a frazzle" had provoked a second unconscious plagiarism from Theodore Roosevelt. *Stet!*

He means not a large proportion of altered plagioclase but much-altered or greatly altered plagioclase.*

One of the humors of turbid writing is the mixing of metaphors, a fault due to the failure of the writer to visualize the picture of his imagination; it illustrates the fact that clear writing requires clear thinking.

The currents [of policy] upon which he [Franklin] was being borne were steadily moving toward **the jaws** of the maelstrom.

He did not have the right picture of a maelstrom, the approach to which is felt by the suction of the whirlpool. However, this slip is not so bad as the following, in which several such blunders appear.

Technology is subordinate to latent shrewdness in sifting facts from the mists and shadows of the past. The experience of the engineer will enable him to eliminate much of the chaff, because many of the stories will collapse under the searchlight of engineering common sense.

He was pleased, as I happen to know, with his own style of writing. If he had applied a little "engineering common-sense", with or without a searchlight, he might have saved himself from such a lapse. Facts are sifted from fancies, not from mists and shadows. A searchlight will not cause the chaff to collapse, it will assist the eye in separating the chaff from the grain.

Alliteration likewise has its pitfalls for the careless:

When the dressing of a mine for sale is carried too far it comes plainly **under** [within] the category of **sinful salting.**

'Salting' means the artificial enriching of ore in a mine for the purpose of deception; therefore "sinful" is redundant, if not silly.

Do not hesitate to define a term the meaning of which may be doubtful. When you do so, avoid the use of terms that themselves need to be explained. As Samuel Johnson said: "To

* G. M. Wood, 'The Principal Faults Found in Manuscripts Submitted for Publication by Members of the United States Geological Survey', 1907.

explain, requires the use of terms less abstruse than that which is to be explained, and such terms cannot always be found. For as nothing can be proved but by supposing something intuitively known, and evident without proof, so nothing can be defined but by the use of words too plain to admit of definition".

Dr. Johnson sinned grossly against his own precept; for example, he defined a 'network' as "that which is reticulated or decussated at equal distances with interstices between the intersections". A fisherman, when a witness in court, defined a net as "little square holes with string tied around them".

Sydney Smith defined an archdeacon as "a man who performs archidiaconal functions"—which left things worse than ever.

The **cementitious** character of Portland **cement** is due to . . .

This is like saying that the essential quality of eggs is egginess. He meant to say that the constituent to which cement owes its essential binding quality is a silicate of lime, or, more exactly, tri-calcic silicate.

The same writer, in a book of some pretensions, said:

In **calcareous** materials **lime** predominates.

He appears to be ignorant of the derivation of "calcareous", which comes from *calx*, lime.

The lime thus **calcined**

This also comes from the book on cement, in which the author uses the words 'lime' and 'limestone' interchangeably and therefore confusedly, because lime is calcium oxide (CaO) and limestone is calcium carbonate ($CaCO_3$). The 'burning', or 'calcining', of limestone yields lime, by expelling the carbonic acid (CO_2). All this is elementary, and therefore it should not be ignored by one who undertakes to teach the technique of cement-making. As Sir Joseph J. Thomson has said: "If you want to arrive at intelligible issues—not to say conclusions—in any discussion, begin by settling the meaning of the terms you are going to use".

Do not define in terms that need to be defined; do not spare definitions. Many technical articles lead nowhere, simply because the writer has not made it clear whither he is driving. To discuss the persistence of ore in depth, for example, is hopeless unless the principal terms, 'ore' and 'depth', are defined. Definitions tend to clear the thought of the writer no less than they clarify the understanding of the reader.

Of William James, the philosopher, whose letters have been published recently, it is said that to him writing was "a mode of communication, rather than of objectivation". He was intimate and personal. "I don't care how incorrect language may be", he said, "if it only has fitness of epithet, energy, and clearness." He seems to have been intensely conscious of the person to whom he was writing, and exerted himself to conquer the understanding and win the sympathy of that person. He depicted his ideas and fitted them to the minds of his readers. The allusion to "incorrect language" is needlessly disarming, for when a writer selects his epithets with skill, puts the pulse of life into his periods, and makes his meaning clear, he has achieved the correctness of language for which we strive continually.