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Title: On the Antiquity of the Chemical Art

Author: James Mactear

Release Date: February 11, 2006 [EBook #17753]

Language: English

Character set encoding: UTF-8

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[Transcriber’s Note:

Typographical errors are listed at the end of the file. Misspelled Greek

names were treated as errors; others are noted but not changed.]

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President’s Opening Address to Chemical Section.

ON THE ANTIQUITY

OF

THE CHEMICAL ART.

By JAMES MACTEAR, F.C.S., F.C.I.

THE PRESIDENT’S OPENING ADDRESS TO THE CHEMICAL SECTION.

\_On the Antiquity of the Chemical Art.\_ By JAMES MACTEAR,

F.C.S., F.C.I., Member of the International Jury,

Paris, 1878, and Medalist of the Society of Arts.

[Read before the Section, December 8th, 1879.]

The study of the History of Chemistry as an art, or as a science, is one

which possesses peculiar fascination for its votaries. It has been the

subject of deep research and much discussion, much has been written upon

the subject, and many theories have been broached to account for its

origin. We have had laid before us by Professor Ferguson, in his papers

on this subject of Chemical History, very clearly and fully the

generally-accepted position as regards the origin of the science, and in

the last of these papers, entitled “Eleven Centuries of Chemistry,” he

deals with the subject in a most complete manner, tracing back through

its various mutations the development of the science to the time of

Geber, in or about the year A.D. 778.

Of Geber, as a chemist, Professor Ferguson writes, “He was the

first--because, although he himself speaks of the ancients, meaning

thereby his forerunners, nothing is known of these older chemists.”

Rodwell, in his “Birth of Chemistry,” after a careful examination of the

question, comes to the conclusion that, “in spite of all that has been

written on the subject, there is no good evidence to prove that alchemy

and chemistry did not originate in Arabia not long prior to the eighth

century, A.D.,” bringing us again to the times of Geber.

He is not alone in this opinion, and it seems to be generally accepted

that chemistry originated in the Arabian schools about this period.

In dealing with the question of the antiquity of chemical art, it has

been too much the habit to look at the question with a view of

discovering when and who it was that first brought forth, fully clothed

as a science, the art of chemistry.

Let us look at the definition of the science given by Boerhæve, about

1732. He describes chemistry as “an art which teaches the manner of

performing certain physical operations, whereby bodies cognizable to the

senses, or capable of being rendered cognizable, and of being contained

in vessels, are so changed by means of proper instruments as to produce

certain determinate effects, and at the same time discover the causes

thereof, for the service of the various arts.”

Now, it is amply evident that, long before the various known facts could

be collected and welded into one compact whole as a science, there must

have existed great store of intellectual wealth, as well as mere

hereditary practical knowledge of the various chemical facts.

I do not think it will be disputed that, until comparatively recent

times, technical knowledge has constantly been in advance of theory, and

that it is not too much to conclude that, no matter where we first find

actual records of our science, its natal day must have long before

dawned. Even in our day, when theoretical science, as applied to

chemistry, has made such immense strides, how often do we find that it

is only now that theory comes in to explain facts, known as such long

previous, and those engaged in practical chemical work know how much

technical knowledge is still unwritten, and what may even be called

traditionary.

I purpose taking up the subject from this point of view, and attempting,

with what little ability I can, to follow back to a still more remote

period than that of Geber and the Arabian school of philosophers the

traces of what has often been called the divine art.

An aspect of the question that has often presented itself to me is this,

that the history of what we call our world extends over some 4000 years

before Christ and 1878 years since, so that, according to the usually

accepted idea, if chemistry originated in Arabia in the eighth century,

it was not known during say the first 5000 years of the world’s history,

but has advanced to its present high position amongst the sciences in

the last 1000 years.

I hope to be able to show that, while the Arabian school of philosophy

get the credit of originating most of the sciences, that it is as

undeserved in the case of chemical science as in that of astronomy or

mathematics. At the same time let us not undervalue the services

rendered to science by this school: it is to them we owe the

distribution of the knowledge of most of our sciences, and the Arabic

literature of most of these was widely spread abroad over all the known

world of their time.

The central portion of Baghdad between the eastern and western portions

of the Old World, and the wise and enlightened policy of its rulers,

which welcomed to its schools, without reference to country or creed,

the wise and learned men of every nation, drew to it as to a centre the

accumulated wisdom and knowledge of both the rising and the setting sun.

Long ere this time, however, we find, as regards the Greeks, that they

constantly travelled eastward in search of learning, while we know that

the expedition of Alexander the Great, about B.C. 327, in which he

traversed a considerable portion of India, had already opened up the

store-houses of Indian lore to the minds of the West.

In connection with this, the following extract from an old book: called

\_The Gunner\_, dated 1664, is interesting:--

“In the life of Apollonius Tyanæus, written by Philostratus 1500 years

ago, we find, in reference to the Indians called Oxydra: These truly

wise men dwelled between the rivers Hyphasis and Ganges; their country

Alexander the Great never entered, being deterred, not by fear of the

inhabitants, but, as I suppose, by, religious considerations, for had he

passed the Hyphasis, he might doubtless have made himself master of the

country all round him; but their cities he could never have taken,

though he had led a thousand as brave as Achilles or ten thousand such

as Ajax to the assault. For they come not out into the field to fight

those who attack them; but these holy men, beloved of the gods,

overthrow their enemies with tempests and thunder-bolts shot from their

walls.

“It is said that Egyptian Hercules and Bacchus (Dionysius), when they

overran India, invaded this people also, and having prepared warlike

engines, attempted to conquer them. They made no show of resistance, but

upon the enemy’s near approach to their cities they were repulsed with

storms of lightning and thunder hurled upon them from above.”

May we not here have the original of the Greek fire, that was in its day

so celebrated and so destructive?

Beginning then at the period of Geber, about 776 A.D., let us try to

work backwards and trace, if we can, the progress of chemical knowledge

down the stream of time.

While the Western Roman Empire had fallen, the Eastern still held its

sway as far as the rivers Tigris and Euphrates, and continued the

contest with the Persian power for the supremacy in Asia. At this time

the various creeds and beliefs of the Arabian tribes--which had been

much influenced by the settlement amongst them of Jews who had been

dispersed at the time of the destruction of Jerusalem, and many of the

sects of Christians who had been driven from the Roman empire by the

more orthodox--were deeply stirred by the new doctrine of Islam,

preached by Mahomet, A.D. 622, proclaiming the Koran as the rule of

life, and the destruction of the ancient Arabian worship of the stars

and sun and moon.

The religion of “the one God and Mahomet his prophet” took deep root,

and the injunction to pursue the unbelieving with fire and sword was

followed out with such unrelenting vigour that, within less than a

century from the death of Mahomet, the Arabian power had extended its

sway amongst nearly every tribe and nation that had owned the rule of

the Roman or Persian empires, and had reached from Spain to India, from

Samarcand to the Indian Ocean.

Egypt and Syria were conquered between A.D. 632-39, and Persia about

A.D. 632-51. Their attempts to take Constantinople by siege failed both

in A.D. 673 and 716. But they were more successful on the African shores

of the Mediterranean, which they swept along till they crossed the

Straits of Gibraltar and entered Spain in A.D. 709. Their further

progress--through France--was stayed by their defeat in a great battle

fought at Tour’s, when the Gauls, under Charles Martel, forced them to

retire ultimately across the Pyrenees.

Internal dissension had, however, arisen amongst them, and the ruling

dynasty of the Ommiades was overthrown in A.D. 750 by the Abassides, who

established themselves at Damascus; and with them began that cultivation

of the arts and sciences which has thrown such lustre on the Arabian

school.

One of the princes of the Ommiades who had escaped made his way to Spain

and there re-established the power of his family, with Cordova as a

centre, about A.D. 755. Thus it was that the Saracenic power was divided

into an Eastern and a Western Caliphate.

It was under the prosperous rule of the Abassides that such an impulse

was given to learning of every kind, and that the Arabian school of

philosophy, which has left behind it such glorious records of its

greatness, was founded. The Caliph Al-Mansour was the first, so far as

we know, who earnestly encouraged the cultivation of learning; but it

was to Haroun Al-Raschid, A.D. 786-808 (?), that the Arabians owed the

establishment of a college of philosophy. He invited learned men to his

kingdom from all nations, and paid them munificently; he employed them

in translating the most famous books of the Greeks and others, and

spread abroad throughout his dominions numerous copies of those works.

His second son, Al-Mamoon, while governor of the province of Kohrassan,

we are told, formed a college of learned men from every country, and

appointed as the president John Mesue, of Damascus. It is said that his

father, complaining that so great an honour had been conferred on a

Christian, received the reply--“That Mesue had been chosen, not as a

teacher of religion, but as an able preceptor in useful arts and

sciences; and my father well knows that the most learned men and the

most skilful artists in his dominions are Jews and Christians.”

That this was the case can scarcely be doubted when we consider that the

Jews had always been familiar with many arts and sciences, and that, as

is well known, at the destruction of Jerusalem in A.D. 70, when the Jews

were dispersed in every direction, they spread over, not alone the

countries under the Roman rule, but to Greece, Egypt, and the

Mediterranean coast, as well as great part of Asia Minor, carrying with

them, not only their peculiar religious traditions, but also their arts,

which, we know, especially as regards the working of metals, were of no

mean order, and their sciences, of which the so-called magic and

astrology had been assiduously cultivated.

In Asia the dispersed Jews established patriarchates at Tiberias in the

west, and at Mahalia, and afterwards at Baghdad, for the Jews who were

beyond the Euphrates.

Seminaries were founded at these centres for the rabbis, and constant

intercourse was kept up between them. It was in these schools that the

Talmud was compiled from the traditionary exposition of the Old

Testament, between A.D. 200 and A.D. 500, when it was completed, and

received as a rule of faith by most of the scattered Jews.

That the cultivation of science was not neglected we may be sure from

the keen interest taken in all ages by the Jews in magical and

astrological inquiries. We read in Apuleius, in his defence on the

accusation of magic brought against him, that of the “four tutors

appointed to educate the princes of Persia, one had to instruct him

specially in the magic of Zoroaster and Oromazes, which is the worship

of the gods.” Apuleius wrote about 200 A.D., and his works teem with

references to magic and astrology.

The fact that Jews and Christians were looked on as learned men will not

surprise us, when we find that the Jews had established schools so long

anterior to the foundation of the college of Baghdad. The rapid progress

made by the Arabians, and the wise policy of the Abasside Caliphs, under

whose judicious rule learning was so liberally encouraged, aided by the

position of Baghdad, which formed, as it were, a centre to which the

wisdom of both eastern and western minds gravitated, attracted to their

schools all those of every nation who boasted themselves philosophers.

The first translations from the Greek authors are supposed to have been

made about A.D. 745, and are known to have been on the subjects of

philosophy, mathematics, astronomy, and medicine. These translations are

understood to have been made by Christian or Jewish physicians.

As we have seen, the Jews had already established themselves at Baghdad,

and had founded schools of their own previous to the formation of the

college under Caliph Al-Mansour; but further than this we find the

Christians spread widely over the countries of Asia Minor, and we are

told, on the authority of Cosmo-Indicopleustes, that so early as A.D.

535 there was in almost every large town in \_India\_ a Christian Church

under the Bishop of Seleucia.

With these facts before us--1st, that Christian physicians were the

leaders of the Arabian school in the eighth century; 2nd, that large

numbers of Christian churches were actually in existence in India at

least two hundred years previously to the establishment of the college

at Baghdad; and 3rd, that Baghdad was almost, as it wore, the central

point of the great caravan route which from time immemorial had been the

course of communication between the East and West, can we doubt that an

extensive intercourse must have taken place, and should we not expect to

find some traces, if not the effects, of Indian science on the teaching

of the Arabian school.[1]

[Footnote 1: As to communication, the case of Saggid Mahmud (given

in Bellew’s \_Indus to the Tigris\_), who, merely to pray for the

recovery of his sick son, travelled with him from Ghazni by way of

Kandahur and Shikarpur to Bombay, thence by way of sea to Baghdad,

from there to Karbola, and back to Baghdad; and then by Kirmanshah

and Kum to Teheran, on his way home to Ghazni, gives an indication

of the long journeys taken under the most frightful difficulties.

This long journey had occupied six months only, and we read that

in former times twelve years were sometimes taken in trading

journeys.]

In Vol. VIII. of the Journal of Education we find a notice that

“Professor Dietz, of the University of Königsberg, who had spent five

years of his life in visiting the principal libraries of Germany, Italy,

Switzerland, Spain, France, and England, in search of manuscripts of

Greek, Roman, and Oriental writers on medicine, is now engaged in

publishing his ‘Analecta Medica.’

“The work contains several interesting papers on the subject of physical

science among the Indians and Arabians, and communicates several

introductory notices and illustrations from native Eastern writers.

Dietz proves that the late Greek physicians were acquainted with the

medical works of the Hindus, and availed themselves of their

medicaments; but he more particularly shows that the Arabians were

familiar with them, and extolled the healing art, as practised by the

Indians, quite as much as that in use among the Greeks.

“It appears from Ibn Osaibe’s testimony (from whose biographical work

Dietz has given a long abstract on the lives of Indian physicians), that

a variety of treatises on medical science were translated from the

Sanscrit into Persian and Arabic, particularly the more important

compilations of Charaka and Susruta, which are still held in estimation

in India; and that Manka and Saleh--the former of whom translated a

special treatise on poisons into Persian--even held appointments as

body-physicians at the Court of Harun-al-Raschid.”

As the age of the medical works of Charaka and Susruta is incontestably

much more ancient than that of any other work on the subject (except the

Ayur Veda)--as we shall see when we come to consider the science of the

Hindoos--this in itself would be sufficient to show that the Arabians

were certainly not the originators of either medical or chemical

science.

We should not forget that it is only to their own works and their

translations, chiefly by the Greeks, we owe our knowledge of the state

of Arabian science, and that it is only in rare cases that we have given

a list of works consulted, so that we can gather the sources from which

their knowledge was derived. It would scarcely be imagined, from reading

the works of Roger Bacon, or of Newton, that they had derived some, at

least, of their knowledge from Arabian sources; and yet such is known to

have been the case with them both.

Let us now glance backwards from the Arabians to the Greeks.

It is supposed that the first translations from the Greek authors were

made for the Caliphs about 745 A.D., and were first translated into

Syriac, and then into Arabic. The works of Aristotle, Euclid, Ptolemy,

Hippocrates, Galen, and Dioscorides are known to have been translated

under the reign of Al-Mansour.

Granting for the moment that the first knowledge of the sciences was

obtained by the Arabians from the Greeks, we are at once face to face

with the question. From whence did the Greeks obtain their knowledge? To

any careful reader it will be clear that Grecian science and philosophy,

like Grecian theology, was not of native birth. It is comparatively well

known that the Greeks were indebted to the Egyptians for much of their

theology as well as science. The great truths which really underlay the

mysterious religious rites of Egypt seem to have been altogether lost

when the Greeks wove their complicated system of theology; and we read

that the Egyptian priests looked on the Greeks as children who failed to

understand the great mysteries involved in their religious rites,

disguised as they were in symbolic form. But, besides their indebtedness

to Egypt, we will find that they also owed much to Persia, and through

it again to Indian sources of knowledge.

There was constant communication between the Grecian and Persian

nations. We learn that it was not uncommon for Grecian generals to take

service under the Persian Satraps, tempted by the liberal recompence

with which their services were rewarded. About the year 356 B.C. this

system of Greeks accepting service under Persian Satraps nearly caused

the outbreak of war between Greece and Persia--Chares, a Grecian

commander, having assisted with his fleet and men, Artabanus, the Satrap

of Propontis, who was then in revolt against the Persian king. But

before this, during the great plague which desolated Athens in 430 B.C.,

and which also extended to Persia, Hippocrates was invited to go to the

Persian Court; and it is on record that Ctesias was for seventeen years

physician at the Persian Court about 400 B.C., during which period he

wrote his history of Persia, and an account of India, which Professor

Wilson, in a paper read to the Ashmolean Society of Oxford, has shown to

contain notices of the natural productions of the country, “which,

although often extravagant and absurd, are, nevertheless, founded on

truth.”

There were, too, Grecian soldiers employed as paid auxiliaries, and a

colony of Greeks who had been taken prisoners of war was founded within

a day’s journey of Susa.

The great expedition to Persia, and the graphic description of the

retreat of the “ten thousand” Greeks, given by Xenophon in his Anabasis,

must have been well known to Alexander the Great when he set out on his

career of conquest. He overthrew the Persian empire in 331 B.C., having

destroyed Tyre and subdued Egypt in the previous year and carried his

triumphant progress to the banks of the Indus, and there he “held

intercourse with the learned sages of India.” On Alexander’s death

Seleucus succeeded to the throne of Persia in 307 B.C., and not long

after he forced his way beyond the Indus, and ultimately as far as the

sacred river Ganges. He formed an alliance with the Indian king

Sandrocottus (otherwise known as Chandra-gupta), which was maintained

for many years, and it is said, also, that he gave his daughter in

marriage to the Indian king, and aided him with Grecian auxiliaries in

his wars.

He sent an expedition by sea, under the command of Patrocles his

admiral, who visited the western shores of India, and a little later he

despatched an embassy under Megasthenes and Onesicrates, the former of

whom resided for some years at the “great city” of Palibothra (supposed

to be Patna).

Not long after Megasthenes was at Palibothra, Ptolemy Philadelphus sent

an expedition overland through Persia to India, and later Ptolemy

Euergetes, who lived between 145-116 B.C., sent a fleet under Eudoxius

on a voyage of discovery to the western shores of India, piloted, as is

said, by an Indian sailor who had been shipwrecked, and who had been

found in a boat on the Red Sea. Eudoxius reached India safely, and

returned to Egypt with a cargo of spices and precious stones.

The proof of very ancient communication between Greece and India is

quite clear, both by way of Persia and Egypt, and we find that the

Greeks, who were in the habit of calling all other nations barbarians,

speak constantly with respect of the gymnosophists--called “Sapientes

Indi” by Pliny. We read also of the Greek philosophers constantly

travelling eastward in search of knowledge, and on their return setting

up new schools of thought. Thales, it is affirmed, travelled in Egypt

and Asia during the sixth century B.C., and it is said of him that he

returned to Miletus, and transported that vast stock of learning which

he had acquired into his own country.

He is generally considered as the first of the Greek philosophers.

Strabo says of him that he was the first of the Grecian philosophers who

made inquiry into natural causes and the mathematics.

The doctrine of Thales, that water was the first elementary principle,

is exactly that of the ancient Hindoos, who held that water was the

first element, and the first work of the creative power. This idea was

not completely exploded even up till the 18th century. We find Van

Helmont affirming that all metals, and even rocks, may be resolved into

water; and Lavoisier, so lately as 1770, thought it worth while to

communicate an elaborate paper “On the nature of water and the

experiments by which it has been attempted to prove the possibility of

converting it into earth.”

Pythagoras, perhaps the greatest of all Greek philosophers, it is known,

travelled very widely, spending no less than twenty-two years in Egypt.

He also spent some considerable time at Babylon, and was taught the lore

of the Magi.

In the famous satire of Lucian on the philosophic quackery of his day

(about 120 A.D.), “The Sale of the Philosophers,” we have a most

interesting account of the system of Pythagoras.

\_Scene--A Slave Mart. \_Jupiter\_, \_Mercury\_, \_philosophers\_, in the garb

of slaves, for sale. Audience of buyers.\_

\_Jupiter.\_--Now, you arrange the benches, and get the place ready for

the company. You bring out the goods and set them in a row; but trim

them up a little first, and make them look their best, to attract as

many customers as possible. You, Mercury, must put up the lots, and bid

all comers welcome to the sale. Gentlemen,--We are here going to offer

you philosophical systems of all kinds, and of the most varied and

ingenious description. If any gentleman happens to be short of ready

money he can give his security for the amount, and pay next year.

\_Mercury (to Jupiter).\_--There are a great many come; so we had best

begin at once, and not keep them waiting.

\_Jupiter.\_--Begin the sale, then.

\_Mercury.\_--Whom shall we put up first?

\_Jupiter.\_--This fellow with the long hair--the Ionian. He’s rather an

imposing personage.

\_Mercury.\_--You, Pythagoras, step out, and show yourself to the company.

\_Jupiter.\_--Put him up.

\_Mercury.\_--Gentlemen, we here offer you a professor of the very best

and most select description. Who buys? Who wants to be a cut above the

rest of the world? Who wants to understand the harmonies of the universe

and to live two lives?

\_Customer (turning the philosopher round and examining him).\_--He’s not

bad to look at. What does he know best?

\_Mercury.\_--Arithmetic, astronomy, prognostics, geometry, music, and

conjuring. You’ve a first-rate soothsayer before you.

\_Customer.\_--May one ask him a few questions?

\_Mercury.\_--Certainly--(\_aside\_), and much good may the answers do you.

\_Customer.\_--What country do you come from?

\_Pythagoras.\_--Samos.

\_Customer.\_--Where were you educated?

\_Pythagoras.\_--In Egypt, among the wise men there.

\_Customer.\_--Suppose I buy you, now, what will you teach me?

\_Pythagoras.\_--I will teach you nothing--only recall things to your

memory.

\_Customer.\_--How will you do that?

\_Pythagoras.\_--First, I will clean out your mind, and wash out all the

rubbish.

\_Customer.\_--Well, suppose that done, how do you proceed to refresh the

memory?

\_Pythagoras.\_--First, by long repose and silence, speaking no word for

five whole years.

\_Customer.\_--Why, look ye, my good fellow, you’d best go teach the dumb

son of Crœsus! I want to talk and not be a dummy. Well--but after this

silence, and these five years?

\_Pythagoras.\_--You shall learn music and geometry.

\_Customer.\_--A queer idea, that one must be a fiddler before one can be

a wise man!

\_Pythagoras.\_--Then you shall learn the science of numbers.

\_Customer.\_--Thank you, but I know how to count already.

\_Pythagoras.\_--How do you count?

\_Customer.\_--One, two, three, four----

\_Pythagoras.\_--Ha! what you call four is ten, and the perfect triangle,

and the great oath by which we swear.

\_Customer.\_--Now, so help me, the great ten and four, I never heard more

divine or more wonderful words!

\_Pythagoras.\_--And afterwards, stranger, you shall learn about Earth,

and Air, and Water, and Fire--what is their action, and what their form,

and what their motion.

\_Customer.\_--What! have Fire, Air, or Water bodily shape?

\_Pythagoras.\_--Surely they have; else, without form and shape, how could

they move! Besides, you shall learn that the Deity consists in Number,

Mind, and Harmony.

\_Customer.\_--What you say is really wonderful.

\_Pythagoras.\_--Besides what I have just told you, you shall understand

that you yourself, who seem to be one individual, are really somebody

else.

\_Customer.\_--What! do you mean to say I’m somebody else, and not myself,

now talking to you?

\_Pythagoras.\_--Just at this moment you are; but once upon a time you

appeared in another body, and under another name; and hereafter you will

pass again into another shape still.

(After a little more discussion of this philosopher’s tenets, he is

purchased on behalf of a company of professors from Magna Græca for ten

minæ. The next lot is Diogenes, the Cynic.)

Apuleius says in the Florida, Section XV., in reference to Pythagoras,

that he went to Egypt to acquire learning, “that he was there taught by

the priests the incredible power of ceremonies, the wonderful

commutations of numbers, and the most ingenious figures of geometry; but

that, not satisfied with these mental accomplishments, he afterwards

visited the Chaldæans and the Brahmins, and amongst the latter the

Gymnosophists. The Chaldæans taught him the stars, the definite orbits

of the planets, and the various effects of both kinds of stars upon the

nativity of men, as also, for much money, \_the remedies for human use

derived from the earth, the air, and the sea\_ (the elements earth, air,

and water, or all nature).

“But the Brahmins taught him the greater part of his philosophy--what

are the rules and principles of the understanding; what the functions of

the body; how many the faculties of the soul; how many the mutations of

life; what torments or rewards devolve upon the souls of the dead,

according to their respective deserts.”

There is ample evidence, therefore, that the Greeks had communication

with, and borrowed the philosophy of, both Persia and India at a very

early date.

That there was intimate intercourse with India in very ancient times

there can be no doubt. In addition to the classical sources of

information collected chiefly by the officers of Alexander the Great,

Seleucus and the Ptolemies, and which was condensed and reduced to

consistent shape by Diodorus, Strabo, Pliny, and Arrian, within the

first century before and the first century after Christ, we have the

further proof of the fact by the constant finds of innumerable Greek

coins over a large portion of north-western India, and even at Cabul.

These, so far as yet known, commence with the third of the Seleucidæ,

and run on for many centuries, the inscriptions showing that the Greek

characters were used in the provinces of Cabul and the Punjab even so

late as the fourth century A.D. The consideration of these coins of the

Græco-Persian empire of the Seleucidæ naturally leads us to the

consideration of the Persians.

I have already shown that the Greeks and Persians held intimate

relations with each other as early as the fourth century B.C., and from

the speech of Demosthenes against a proposed war with Persia, delivered

in 354 B.C, we may well believe that they had already had a long and

intimate connection with each other. The passage rends thus:-

“All Greeks know that, so long as they regarded Persia as their common

enemy, they were at peace with each other, and enjoyed much prosperity,

but since they have looked upon the King (of Persia) as a friend, and

quarrelled about disputes with each other, they have suffered worse

calamities than any one could possibly imprecate upon them.”

The Persian empire was founded by Cyrus, about B.C. 560, and rapidly

rose to be perhaps the greatest power of the world of that age. The rise

of the Persian empire is not unlike that of the Arabian power in regard

to the wide range of conquest achieved in a very limited period. Its

actual existence, from the foundation of the empire by Cyrus in B.C. 560

to the death of Darius III., was barely two centuries and a half.

Previous to the Persian empire there existed three principal powers in

Asia--the Medes, the Chaldæans or Babylonish, and the Lydian. Of these

the Medes and Chaldæans were the most ancient, and their joint power

would seem to have extended eastward as far as the Oxus and Indus.

Of these nations the Babylonians were the most highly civilized, and,

did time permit, we might find much that would interest and instruct in

examining the various facts relating to the arts and sciences amongst

these nations. We know that arts and sciences must have been diligently

cultivated amongst them, and that magic and astrology were held in high

repute.

That the Persians were well acquainted with other nations is shown

clearly from the remains of their great city of Persepolis, where the

sculptured figures represent many types of mankind--the negro, with

thick lips and flat nose, and with his crisp, wooly hair, clearly cut;

and the half-naked Indian, with his distinguishing features, being

easily singled out from many others.

Persia held sway over a huge district of India--the limits of this are

not known; but, in addition, they were well acquainted with a large

portion of the north-western part of India.

The traditions and historical records of the Persians are contained in

the famous series of writings culled the Zend-avesta. These writings

are, it is thought, of an age even before the Persian dynasty was

established; and it has been shown by the researches of M. Anguetil and

Sir W. Jones that there is indeed a great probability of the Zend having

been a dialect of the ancient Sanscrit language. In the vocabulary

attached to M. Anguetil’s great work on the Zend-avesta no less than 60

to 70 per cent. of the words are said to be pure Sanscrit.

As the oldest known language of Persia was Chaldæic, we are again thrown

back on Indian sources for the origin of the great book of the ancient

Persians. Even the name of the priests of the Persian religion of

Zoroaster, Mag or Magi, is of Sanscrit derivation.

The Persians kept up an enormous army, which was spread through all the

various provinces and Satrapies, and consisted in great part of paid

auxiliaries. In at least the later period of Persian power the Greeks

were preferred to all others, and in the time of Cyrus the Younger they

composed the flower of the Persian army, and were employed in

garrisoning most of the chief cities of Asia Minor.

The description given by Herodotus of the vast army and fleet prepared

for the expedition of Xerxes against the Greeks gives us an idea of the

extent of the Persian power, and of the wide range of countries and

nations over which they held sway. The review held on the Plain of

Doriscus was perhaps the greatest military spectacle ever beheld either

before or since. Herodotus enumerates no less than 56 different nations,

all of them in their national dress and arms. Besides the Persians there

were “Medes and Bactrians; Libyans in war chariots with four horses;

Arabs on camels; Sagartians, wild huntsmen who employed, instead of the

usual weapons of the time, the lasso; the nomadic tribes of Bucharia and

Mongolia; Ethiopians in lions’ skins, and Indians in cotton robes;

Phœnician sailors, and Greeks from Asia Minor.” All these and many

others were there assembled by the despotic power of the Persian king.

The system of government employed by the Persians, and the constant

reports and tributes sent from every province to the central court of

the king, were well calculated to bring to it, as to a focus, the

curious lore of the various nations who came in contact with or were

subdued by them.

The Persians were famed for their knowledge of astronomy and astrology,

and were said “to have anciently known the most wonderful powers of

nature, and to have therefore acquired great fame as magicians and

enchanters.”

The close relation between the Persian religious traditions and those of

the Hindoos is very striking. According to Mohsan, “The best informed

Persians, who professed the faith of Hu-shang as distinguished from that

of Zeratusht, believes that the first monarch of Iran, and, indeed, of

the whole world, was Mahabad (a word apparently Sanscrit), who divided

the people into four orders,--the religious, the military, the

commercial, and the servile, to which he assigned names unquestionably

the same as those now applied to the four primary classes of the

Hindoos.”

They added, “that he received from the Creator and promulgated amongst

men a \_sacred book in a heavenly language\_, to which the Musselman

author gives the \_Arabic\_ title of \_Desatir\_, or Regulations, but the

original name of which he has not mentioned; and that \_fourteen

Mahabads\_ had appeared, or would appear, in human shapes for the

government of this world.”

“Now when we know that the Hindoos believe in \_fourteen Menus\_, or

celestial persons with similar functions, the \_first\_ of whom left a

book of \_regulations\_, or divine ordinances, which they hold equal to

the \_Veda\_, and the language of which they believe to be that of the

gods, we can hardly doubt that the first corruption of the purest and

oldest religion was the system of \_Indian\_ theology invented by the

\_Brahmins\_ and prevalent in those territories where the book of Mahabad,

or Menu, is at this moment the standard of all religious and moral

duties.”

Having established, then, the long and intimate nature of the Persian

intercourse with India, let us see how it bears on our more immediate

subject.

The works on medicine which are known to exist, and to have been written

in Persian, are not very many in number, but they cover a period of time

of nearly 400 years. The oldest of them is of the year 1392 A.D., and in

it and its successors there are long lists of Arabian authors whose

works had been consulted, and also various Indian works.

Greek physicians were in great request at the Persian court, and when

the daughter of the Emperor Aurelian was sent in marriage to the Persian

monarch, Sapor II., she had a number of Greek physicians in her train.

This king founded a new city called Jondisabour in honour of his Queen,

and owing to the settlement here of a number of Greek physicians, who

had, on account of religious differences, retired into Persia, this city

became celebrated as a medical school. Dr. Friend gives the names of

these as “Damascius the Syrian, Simplicius of Cilicia, Diogenes of

Phænicea, Isidorus of Gaza, and others, the most learned and greatest

philosophers of the age.” It is thought by some authors that many of the

Arabian writers who belonged to the college of Baghdad were educated at

Jondisabour.

The district of Jondisabour is even yet one of the most nourishing in

Persia, and contains mines which still yield turquoise, salt, lead,

copper, antimony, iron, and marble.

During the reign of the Persian king Nooshirwan, his physician Barzoueh

made various journeys into India, one of which was specially for the

purpose of obtaining copies of Indian literature, and another to obtain

medicaments and herbs.

How to account for the strange fact that all schools of medicine which

have risen, flourished, and disappeared, have left some trace in

historical records, with the exception of that of India, is most

difficult, unless under the hypothesis that the language in which the

science and philosophy of India was recorded has been almost a sealed

book to the world, and is even now quite unintelligible to the people of

India itself, generally speaking, and that thus the only way in which

the results of the long ages of philosophic study, which unquestionably

have had a place in India, have only been known by this dark reflection

from the writings of Greek and Arabic writers, which were scattered

broadcast over the ancient world. The Greeks, we know, borrowed their

science largely from the Egyptians, both in respect to theology and

philosophy; and we might, with much profit, pursue the examination of

our subject amongst the records of that highly civilized amongst the

ancient nations.

Many authors have attempted to show that there is a wonderful

resemblance between the Egyptians and the Hindoos, the sculptures on the

monuments of the former are most wonderfully like those of India, and

the features, dress, and arms are all as like as may be.

Both nations had the various arts of weaving, dyeing, embroidering,

working in metals, and the manufacture of glass, and practised them with

but little difference in their methods. The fine muslins of India find

their counterparts as “woven wind” in the transparent tissues figured on

the Egyptian temples. The style of building, the sciences of astronomy,

music, and medicine were assiduously cultivated by both nations, and

there was direct intercourse between them, perhaps even before

historical time begins.

Rameses the Great (III.), called also Sesostris, fitted out not only war

ships but merchant vessels for the purpose of trading with India, in

B.C. 1235, and Wilkinson in his book on the Ancient Egyptians, tells us

that in 2000 B.C. there were no less than 400 ships trading to the

Persian Gulf. There is, after all, nothing surprising in this when we

remember the fact, which is, however, not generally known, I am afraid,

that under the reign of Pharoah Necho, a fleet of his ships safely

circumnavigated Africa, from the Red Sea to the Mediterranean, this

being in advance of the celebrated voyage of Diaz and Vasco da Gama by

no less than 2100 years.

No less than seven centuries before Thales went to study in Egypt,

astronomical calculations were inscribed on the monuments at Thebes, so

that we can see how modern by comparison the Greek philosophy appears.

In a note Wilkinson says that “The science of Medicine was one of the

earliest cultivated in Egypt. Athothes, the successor of Menes of the

first dynasty, is said to have written on the subject, and five papyri

on the subject have survived.

“They are of the period of the eighteenth and nineteenth dynasties.

“One known as the Papyrus Ebers, from its discoverer, is attributed to

the age of Kherpheres or Bikheres.

“The second, that of Berlin, found in the reign of Usaphais of the first

dynasty, was completed by Senet or Sethenes of the second line.

“The third, that of the British Museum, contains a receipt said to have

been mysteriously discovered in the reign of Cheops of the fourth

dynasty.

\* \* \* \* \* \* \* \* \* \* \* \* \* \*

“The curatives employed were ointments, drinks, plasters, fumigations

and clysters, and the drugs employed were taken from vegetables,

minerals, and animals.

“Those for each draught were mixed together, pounded, boiled, and

strained through linen.

“The doctors belonged to the sacred class, and were only permitted to

practice their own particular branch.

“These were oculists, dentists, those who confined their practice to

diseases of the head, and those again who only attended to internal

diseases; they were paid from the public treasury, and were compelled,

before being permitted to practice, to study the precepts laid down by

their predecessors.”

Homer, in the Odyssey, describes Egypt “as a country whose fertile soil

produces an infinity of drugs, some salutary and some pernicious, where

each physician possesses knowledge above all other men.”

The mixing of various drugs and minerals must have produced effects

which could not be lost on such observant men as the doctors must, from

their training, have been, and it would be absurd to suppose that some,

at least, of the simpler chemical decompositions and combinations were

not known to them.

The manufacture of glass would seem to have been very ancient amongst

the Egyptians, and the insufficiency of the old fable, of its discovery

by the fusing of blocks of stone in the fire is quite clear; besides,

Egyptian glass has been found which contains potash, and nothing is more

probable than that the nitrate of potash, found so plentifully in the

soil of India, was imported for this manufacture.

Precious stones or amulets with Sanscrit inscriptions have repeatedly

been found in tombs, which must date back to at least B.C. 1400.

In tracing back the history of Chemistry, we constantly find reference

to Hermes, Trismegistus, who would seem to be the god Thoth, or Taaut of

the Egyptians. The famous inscription of the Emerald table ascribes to

him the possession of three parts of the philosophy of the whole world.

I have been much struck with the resemblance of this god Taaut with the

Menu of the Hindoos, who also was credited with saving from destruction

by the flood the three Vedas, which were supposed to contain all that

was required for man’s direction here below.

There would appear to have been also other Hermes, but if we look at the

condition of things which obtained in Egypt when the Pyramids of Memphis

are supposed to have been erected, within 300 years of the supposed date

of the deluge, and that the Beni Hassan tombs, about 300 years later,

depict the manners and customs of what we cannot help admitting, was a

highly civilized nation, we must be struck with the fact that the

distance of time between the deluge and the building of these pyramids

and tombs is so short, that it might be represented by a comparison of

our own date with those of Queen Elizabeth and Henry the Third.

Jackson in his “Antiquities” tells us that, Sanchoniatho states that the

most ancient Phœnician records show that letters were invented soon

after the dispersion of mankind, by Tsaut, the son of Mizor or Misraim,

who was the first Egyptian Hermes or Thoth. He went out of Phœnicia, and

first, with a colony of Mizrites, settled and reigned in Egypt, and,

according to Cicero, gave both laws and letters to the Egyptians.

This Hermes was born in the second generation after the flood, and was

not only the inventor of letters and writing, but he is also said to

have delineated the sacred characters or symbols of the elements and

planets, viz.,--sun, moon, earth, air, fire, water, &c.

These symbols are without doubt of very ancient origin, and Boerhæve in

his Theory of Chemistry explains them hieroglyphically as follows:--

[Transcriber’s Note:

The listed symbols are included in the “images” directory

accompanying the html version of this file.]

＋ Denotes anything sharp, gnawing, or corrosive; as vinegar or fire:

being supposed to be stuck around with barbed spikes.

☉ Denotes a perfect immutable simple body, such as gold, which has

nothing acrimonious or heterogeneous adhering to it.

☽ Denotes half gold, whose inside, if turned outward, would make it

entire gold, as having nothing foreign or corrosive in it; which the

alchemists observe of silver.

☿ Denotes the inside to be pure gold, but the outer part of the colour

of silver and a corrosive underneath, which, if taken away, would leave

it mere gold, and this the adepts affirm of mercury.

♀ Denotes the chief part to be gold; whereto, however, adheres another

large, crude, corrosive part, which, if removed, would leave the rest

possessed with all the properties of gold, and this the adepts affirm of

copper.

♂ Likewise denotes gold at the bottom, but attended with a great

proportion of a sharp corrosive, sometimes amounting to a half of the

whole, whence half the character expresses acrimony; which, accordingly,

both alchemists and physicians observe of iron, and hence that common

opinion of the adepts that the aurum vivum, or gold of the philosophers,

is contained in iron, and that the universal medicine is rather to be

sought in this metal than in gold itself.

♃ Denotes half the matter of tin to be silver, the other a crude

corrosive acid, which is accordingly confirmed by the assayers; tin

proving almost as fixed as silver in the cupel, and discovering a large

quantity of crude sulphur well known to the alchemists.

♄ Denotes almost the whole to be corrosive, but retaining some

resemblance with silver, which the artists very well know holds true of

lead.

♁ Denotes a chaos--world, or one thing which includes all: this is the

character of antimony, wherein is found gold, with plenty of an

arsenical corrosive.

The symbols, or at least some of them, may be traced even in the Chinese

characters for gold, silver, &c.

The connection of Egypt with India shortly after the Christian era is

distinctly indicated in the works of Apuleius. He lived in the early

part of the second century after Christ, and was educated first at

Carthage, then renowned as a school of literature. He then travelled

extensively in Greece, Asia, and Egypt, and became initiated into many

religious fraternities and an adept in their mysteries. He was admitted

a priest of the order of Æsculapius, and describes the ceremony of the

offering of the first-fruits by the priests of Isis, when the navigation

opened in spring. The vessel, which was to be set adrift upon the ocean

freighted with the offering, was splendidly decorated and covered with

hieroglyphics, and after having been “\_purified with a lighted torch, an

egg, and sulphur\_,” was allowed to sail away into the unknown as a

sacrifice to procure the safety of the convoy of ships which would soon

after start upon their voyage. These rites were of great antiquity.

He speaks, in his first tale, of a witch who, by means of her magic

charms, made not only her fellow-countrymen love her, but “\_the Indians

even\_,” and in his initiation into the mysteries of Isis, his robes

“bore pictures of Indian serpents.”

From what I have now laid before you, in what must necessarily be a very

imperfect manner, you will see that there is good reason to believe that

in the study of science and philosophy the Indian races were much in

advance of the Western nations. The age of science amongst them is very

great; we fail utterly in trying to find its beginning, unless we accept

the tradition which ascribes to Menu, their great lawgiver (who is

supposed to have been Noah), the saving of three out of the four divine

books or Vedas from the deluge. This would carry us back to the

Antediluvian times for the beginning of our investigations; but without

taking any such extreme view of the subject we will find traces of

science clearly marked out for us in the history of the Indian races.

The picture of the Brahmins, drawn by Apuleius in the second century,

shows how little they have changed in historical times. He says:--

“The Indians are a populous nation of vast extent of territory, situated

far from us to the east, near the reflux of the ocean and the rising of

the sun, under the first beams of the stars, and at the extreme verge of

the earth, beyond the learned Egyptians and the superstitious Jews and

the mercantile Nabathæans; and the flowing robed Aracidae, and the

Ityraeans, poor in crops, and the Arabians, rich in perfumes.

“Now, I do not so much admire the heaps of ivory of the Indians, their

harvests of pepper, their bales of cinnamon, their tempered steel, their

mines of silver, and their golden streams, nor that among them, the

Ganges, the greatest of all rivers,

‘Rolls like a monarch on his course, and pours

His eastern waters through a hundred streams,

Mingling with ocean by a hundred mouths,’

“nor that these Indians, though situated at the dawn of day, are yet of

the colour of night, nor that among them, immense dragons fight with

enormous elephants, with parity of danger to their mutual destruction,

for they hold them enwrapped in their slippery folds, so that the

elephants cannot disengage their legs or in any way extricate themselves

from the scaly bonds of the tenacious dragons. They are forced to seek

revenge from the fall of their own bulk and to crush their captors by

the mass of their own bodies.

“There are amongst them various kinds of inhabitants. I will rather

speak of the marvellous things of men than of those of nature.

“There is among them a race who know nothing but to tend cattle, hence

they are called neatherds; there are races clever in trafficking with

merchandise, and others stout in fight, whether with arrows, or hand to

hand with swords.

“There is also among them a pre-eminent race called Gymnosophists.

“These I exceedingly admire, for they are men skilled not in propagating

the vine, nor in grafting trees, nor in tilling the ground. They know

not how to cultivate the fields, nor to wash gold, or to break horses,

or to shear or feed sheep or goats.

“What is it, then, they know? One thing instead of all these. They

\_cultivate wisdom\_, both the aged professors and the young students.

Nothing do I so much admire in them as that they hate torpor of mind and

sloth.”

This does not look as if the Indians had been unknown or unappreciated

in the second century A.D.

Apuleius is not alone in his respect for the Brahmins. Many of the Greek

writers speak of them under the names of Brahmins or Gymnosophists, but

always with great respect.

Strabo states, on the authority of Megasthenes (who it will be

remembered was Ambassador from Persia, and lived for some years at

Palibothra, about 307 B.C.), that “there were two classes of

philosophers or priests, the Brachmanes and the Germanes, but the

Brachmanes are best esteemed.” Towards the close of his account of the

“Brachmanes” he says:--

“In many things they agree with the Greeks, for they affirm that the

world was produced, and is perishable, and that it is spherical; that

God, governing it as well as framing it, pervades the whole; that the

principles of all things are various, but water is the principle of the

construction of the world; that besides the four elements there is a

fifth, nature--whence heaven and the stars; that the earth is placed in

the centre of all.

“Such, and many other things are affirmed of reproduction and of the

soul. Like Plato, they devise fables concerning the immortality of the

soul, and the judgment in the infernal regions, and other similar

notions. These things are said of the Brachmanes.”

Clemens Alexandrinus, after saying that philosophy flourished in ancient

times amongst the barbarians, and afterwards was introduced amongst the

Greeks, instances the prophets of the Egyptians, the Chaldees of the

Assyrians, the Druids of the Gauls (Galatæ), the Samauæans of the

Bactrians, the philosophers of the Celts, the Magi of the Persians, and

the Gymnosophists of the Indians. The Greek authors distinctly speak of

the Brahmins as the chief of the castes or divisions of the Indian

people from the time of Megasthenes, who wrote of them in the fourth

century B.C.

Sir William Jones, in a paper on the philosophy of the Asiatics, pointed

out that “the old philosophers of Europe had some idea of centripetal

force, and a principle of universal gravitation,” and affirms that “much

of the theology and philosophy of our immortal Newton may be found in

the Vedas.”

“That \_most subtle spirit\_ which he suspected to pervade natural bodies,

and lying concealed in them, to cause attraction and repulsion, the

emission, reflection and refraction of light, electricity, calefaction,

sensation, and muscular motion, is described by the Hindus as a \_fifth

element\_, endowed with these very powers; and the Vedas abound with

allusions to a force universally attractive, which they chiefly ascribe

to the sun, thence called ‘Aditya, or the attractor,’ a name designed by

the mythologists to mean the child of the goddess Aditi. But the most

wonderful passage on the theory of attractions occurs in the charming

allegorical poem of ’Shi’ri’n and Ferhai’d, or the Divine Spirit, and a

human soul disinterestedly pious,’ a work which, from the first verse to

the last, is a blaze of religious and poetical fire.

“The whole passage appears to me so curious that I make no apology for

giving you a faithful translation of it:--

“\_There is a strong propensity which dances through every atom, and

attracts the minutest particle to some peculiar object; search this

universe from its base to its summit, from fire to air, from water to

earth (the four elements!), from all below the moon to all above the

celestial spheres, and thou wilt not find a corpuscle destitute of that

natural attractability. The very point of the first thread in this

apparently tangled skein is no other than such a principle of

attraction, and all principles beside are void of a real basis: from

such a propensity arises every motion perceived in heavenly or in

terrestrial bodies; it is a disposition to be attracted which taught

hard steel to rush from its place and rivet itself on the magnet; it is

the same disposition which impels the light straw to attach itself

firmly on amber; it is this quality which gives every substance in

nature a tendency towards another, and an inclination forcibly directed

to a determinate point.\_”

In Sir W. Ainslie’s Materia Medica of India the opinion of an old Hindoo

author is given as to the qualifications required in a physician.

“He must be a person of strict veracity, and of the greatest sobriety

and decorum: he ought to be skilled in all the commentaries on the

‘Ayur-Veda,’ and be otherwise a man of sense and benevolence: his heart

must be charitable, his temper calm, and his constant study how to do

good.

“Such a man is properly called a good physician, and such a physician

ought still daily to improve his mind by an attentive perusal of

scientific books.

\* \* \* \* \* \* \* \* \* \* \* \* \* \*

“Should death come upon us while under the care of a person of this

description, it can only be considered as inevitable fate, and not the

consequence of presumptuous ignorance.”

The knowledge of the Hindoos may be all said to be contained in their

sacred books called the Vedas, which, although perfect as a whole, are

actually divided into four parts, each in itself constituting a separate

Veda under a special title. These are the Rig-Veda, the Yajur-Veda

(white and black), the Sama-Veda, and the Atharva-Veda, or Ayur-Veda.

Although the last is admitted to be as a whole not so ancient as the

other three, still there are portions of it that are probably as old as

any of the others. Even in the oldest epic poems of the Hindoos mention

is made of four Vedas as already in existence and as of great antiquity.

Sir William Jones estimates the date of its compilation as certainly not

after B.C. 1580.

These Vedas are considered by the Hindoos to contain the groundwork of

all their philosophy, as well as of their arts and sciences, and they

contain treatises on music, medicine, the art of war, and architecture.

Sir William Jones, in referring to the Ayur-Veda, says that, to his

astonishment, he found in it an entire Upanishad on the internal parts

of the human body, enumerating the nerves, veins, and arteries.

The Ayur-Veda was considered by the Brahmins to be the work of

Brahma--by him it was communicated to Dacsha, the Prajapati, and by him,

the two Aswins, or sons of Surya--the sun--were instructed in it, and

thus became the medical attendants of the gods. A legend that cannot but

recall to our mind the Greek myth of the two sons of Æsculapius and

their descent from Apollo.

In the case of immortal gods the practice was confined to surgery, in

treating the wounds received in the conflicts which were constantly

described as occurring amongst the gods themselves, or between the gods

and the demons. Of course they performed many miraculous cures, as would

be expected from their superhuman character.

Professor Wilson published in the \_Oriental Magazine\_, in 1823, some

notices on early Hindoo Medicine, and he points out that the tradition

is, that the above “two Aswins instructed Indra in medical and surgical

art, that Indra instructed Dahnwantari; although others make Atreya,

Bharadwaja, and Charaka prior to the latter:--Charaka’s work, which goes

by his name, is extant. Dahnwantari is also styled Kasi-rajah, or Prince

of Kasi, or Benares. His disciple was Susruta, his work also exists.”

The Ayur-Veda, as the oldest medical writings of the Hindoos are

collectively called, was divided into eight divisions. These are

described by Professor Wilson as follows:--

“1st. \_Salya.\_--The art of extracting extraneous substances, violently

or accidentally introduced into the body, with the treatment of the

inflammation and suppuration thereby induced.

“The word \_Salya\_ means a dart or arrow, and points clearly to the

origin of this branch of Hindoo science.

“2nd. \_Salakya.\_--The treatment of external affections or diseases of

the eyes, nose, ears, &c.

“3rd, \_Kayao Chikitsa.\_--The general application of medicine to the

body, or the science of medicine, as opposed to surgery under the two

first heads.

“4th. \_Bhutavidya\_, or demonology: the act of casting out demons, which

we may take to mean the treatment of insanity, such as it was.

“5th. \_Kaumara bhritya\_, or the treatment of the diseases of women and

children.

“6th. \_Agada.\_--The administration of antidotes.

“We do not appreciate this as an eastern nation would when poison was

only too common an instrument of ambition or revenge.

“7th. \_Rasayana.\_--Is chemistry, or perhaps it were better to say

alchemy, as its chief aim was the study of combinations of substances

mostly metallurgic, with a view of obtaining the universal medicine or

elixir which was to give immortal life.

“8th. \_Bajikarana.\_--Was connected with the means of promoting the

increase of the human race.”

One of the articles of Hindoo medicine was \_Kshara\_ or alkaline

salts,--these are directed to be obtained by burning different

substances of vegetable origin, boiling the ashes with five or six times

their measure of water and filtering the solution, which was used both

internally and externally. Care is enjoined in their use, and emollient

applications are to be used if the caustic should occasion great pain.

I have already spoken of the fact of Indian physicians having been at

the Court of Persia, and also at that of Haroun al Raschid, and also

that the ancient writers on medicine were known to the Arabs of the time

of the schools of Baghdad and Cordova. There is no manner of doubt

concerning this fact, as in Serapion’s works we find Charak actually

mentioned by name; under the head \_De Mirobalanis\_ we find “\_Et Xarch

indus dixit;\_” and again, in another section “\_Xarcha indus;\_” there

being no corresponding sound to che in Arabic, there is a slight change

in the name, but it is quite clear what it is intended for. In Avicenna,

again, we find reference to “Scirak indum.” Rhazes, again, who was

previous to Avicenna, has “\_Inquit Scarac indianus\_,” and again “\_Dixit

Sarac;\_” in another place an Indian author is quoted, who has not as yet

been traced, “\_Sindifar\_,” or, as it is in another place, “\_Sindichar

indianus.\_”

Professor Wilson, in a notice on the medical science of the Hindoos,

published in the \_Oriental Magazine\_, examines into the distinctive

qualities of the various sorts of leeches, and shows that the

description given in Avicenna, in the section “De Sanguisugis,” is

almost identical with the Hindoo author’s description of the twelve

sorts of leeches, in distinguishing the appearance and properties of the

various sorts.

That this is more than a mere coincidence is clear from the fact that

Avicenna says “\_Indi dixerunt\_.”

I do not think it will be seriously disputed that the Arabs had access

to the Hindoo works of and before their time, and we will find, if we

carefully examine the subject, that the science of medicine as

distinguished from surgery, and of chemistry as a part of that science

of medicine, was much more ancient than we have been prepared to admit.

It would be incredible to believe that amongst a people so observant and

highly cultured as the Brahmins must have been, that medicine and the

changes occurring in mixtures of various substances should have been

unstudied, and there is no doubt that this subject was far from being

neglected by them.

Many natural productions of the country, such as nitrate of potash,

borax, carbonate and sulphate of soda, sulphate of iron, alum, common

salt, and sulphur, could scarcely escape the notice of even ordinary

men; but Dr. Ainslie has shown, from the evidence of old Indian medical

works, that they were not only acquainted with ammonia (which they made

by distilling salammoniac one part, and chalk two parts), but that they

prepared sulphuric acid by burning sulphur and nitre together in earthen

pots, calling it \_Gunduk Ka Attar\_, or “attar of sulphur.” Nitric acid,

which was prepared, not by the process described by Geber, but by mixing

saltpetre, alum, and a portion of a liquor obtained by spreading cloths

over the common gram plant, and leaving them exposed to the dew, when

they were found to absorb the acid salt so abundantly secreted by the

plant on the surface of its leaves, and which, when examined by

Vauquelin, was found to contain both oxalic and acetic acids.

Muriatic acid was also made by distilling alum and common salt, dried

and pounded with the above acid liquor.

Arsenic was used by them for the cure of palsy, and also for venereal

diseases, and is still used by them for this purpose, and in

intermittent fevers.

It would occupy too much time to go further into this subject at the

present time, but there are many chemical compounds which are still made

and sold in the Indian bazaars which have been used from time

immemorial, and which require a knowledge of chemical manipulation in

the arts of subliming, distilling, &c.

Mr. Rodwell says, “that the distillation of cinnabar with iron,

described by Dioscorides, is the first crude example of distillation,

which afterwards became a principal operation among the alchemists and

chemists for separating the volatile from the fixed.”

That this is an assumption which has no foundation in fact is evident,

when we find in the Institutes of Menu many enactments against the

drinking of distilled spirits, and these made of various kinds and

distilled from molasses (or sugar-cane juice), rice, and the madhuca

flowers.

“A soldier or merchant drinking arak, mead, or rum are to be considered

offenders in the highest degree,” and “for drinking spirits are to be

branded on the forehead with a vintner’s flag,” rather a summary way of

treating a drunkard, and one which would indicate that the ill effects

of over-indulgence in spirituous liquors had been long known, when such

severe enactments were made against it.

The method of distilling described by Mr. Kerr in the Asiatic

Researches, vol. 1, is so simple that it is almost certain that it was

employed in very ancient times for the purpose of distilling spirits,

and also attars of various sorts, which, from time immemorial, would

seem to have been a special production of India.

“The body of the still is a common large unglazed earthen water jar,

nearly globular, of about 25 inches diameter at the widest part of it,

and 22 inches deep to the neck, which neck rises 2 inches more, and is

11 inches wide in the opening; this was filled about a half with

fermented mâhwah flowers, which swam about in the liquor to be

distilled.

“This jar they placed in a furnace, not the most artificial, though not

seemingly ill adapted to give a great heat with but very little fuel.

This they made by digging a round hole in the ground, about 20 inches

wide and full 3 feet deep, cutting an opening in the front sloping down

to the bottom, perpendicular at the sides, about 9 inches wide and about

15 inches long, reckoning from the edge of the circle: this is to serve

to throw in the wood and to allow a passage for the air; at the other

side a small opening about 4 inches by 3 inches is made to serve as an

outlet for the smoke, the bottom of the hole thus made was rounded like

a cup.

“The jar was placed in this as far as it would go, and banked up with

clay all round to about a fifth of its height, except at the two

openings, when all was completed so far as the furnace was concerned.

“Fully one third of the still or jar was exposed to the heat when

the fire was lighted; the fuel was at least 2 feet from the bottom

of the jar.

“On to this jar there was now fitted what is called an adkur, this being

made of two earthen pans with their bottoms turned towards each other,

and a hole of about 4 inches diameter in the middle of each of them, the

lower of these pans fitted the hole in the jar, and was luted with clay,

the upper was luted to the lower one, and had a diameter of about 14

inches, the juncture formed a neck of about 3 inches, the upper pan was

about 4 inches deep, with a rim round the central hole, this formed a

gutter, and by means of a hollow bamboo luted to this, the spirit, as it

condensed, ran off into the receiver.

“The arrangement was now completed by luting on a small copper pot or

vessel about 5 inches deep, 8 inches wide at mouth, and about 10 inches

at bottom, with its mouth downwards.

“The cooler was formed by placing on a support at the back of the

furnace an earthen vessel containing a few gallons of water, from which,

by means of a bamboo tube, the water was allowed to run on to the centre

of the copper pot, from where it collected in the clay saucer, and ran

off by a small hole and bamboo tube for use again.

“In about three hours’ time from lighting the fire, they draw off fully

fifteen bottles of spirits.”

Comparing this simple form of apparatus with those described by Geber,

we must admit that there is no doubt of the earlier date of this simple

apparatus; and, as we have seen, distilled spirit is expressly mentioned

in the Institutes of Menu, we are bound to admit that distillation was

in use long ere the Arabian times and that of Dioscorides.

Many such examples might be examined, but I will take one for

illustration--that of the manufacture of common salt.

Let us take this manufacture as a typical one.

We find in Jackson’s Antiquities and Chronology of the Chinese that,

2500 B.C., Shin-nong invented the method of obtaining salt from

sea-water. He also gets credit for having composed books on medicine.

In George Agricola’s De Re Metallica (1561) there is a curious set of

woodcuts representing the manufacture of salt, and in the first, in

which the whole process of evaporating sea-water by the sun’s rays is

shown most completely from the raising of the sluices to allow the water

to flow into the various evaporating ponds, to the packing of the

finished salt in barrels--it is a curious fact that the trees which are

introduced are \_palms\_, and the figure in the distance is dressed in

\_Oriental costume\_, while even the ship seems to partake of this

character.

A more advanced state of things is shown in the third drawing of the

12th book, where a pan is shown, made of iron plates riveted together so

as to form a flat sheet, which forms the bottom of the pan, of which the

sides are composed of thick wood, strengthened with plates of iron at

the corners.

The bottom of the pan has a series of iron eyes or loops, and these,

when it is fixed over its furnace, are attached to iron rods, which are

hung from a network of wooden bars, so that the whole bottom of the pan

is supported securely at a considerable number of points.

The furnace is very simple, being simply a wall surrounding an oblong

space, a little smaller than the pan, so that the sides of the latter

may rest on the walls all round, except for a small space in front where

the fuel is introduced, which apparently burns on the ground alone.

The method of manufacturing salt in Japan is almost identical with that

figured in Agricola. There is the same arrangement of salt garden or

series of ponds and ditches, and the dirty salts mixed with sand are

again lixiviated, and the filtered liquid is boiled down in curiously

formed pans or boilers.

Of these there are two chief forms, the first being a tank or pan formed

of large pieces of slate, with the joints made with clay, and surrounded

with a mud wall. The whole is covered with an arch or vault and is

filled with the brine, which is then evaporated by surface heat, the

fire being placed at one end and the flue at the other.

The other form is very curious and interesting, and is almost identical

in its principle of construction with the pan I have referred to as

figured in Agricola, only in this case the materials are very different,

being, instead of wood and iron, nothing more than clay or mud.

It was described officially by the Japanese, in their publications at

the Philadelphia Exhibition in 1876. The Japanese description of this

apparatus is highly interesting. It is as follows:--

A low wall is built, enclosing a space of about 13 feet by 9 feet, the

bottom forming a kind of prismatical depression, 3 feet deep in the

centre line. An ashpit, 3 feet deep, is then excavated, starting from

the front wall, and extending about 4 feet into this depression at its

deepest place; it communicates with the outside by a channel sloping

gradually upwards, and passing underneath the front wall. The ashpit is

covered by a clay vault, with holes in its sides, so as to establish a

communication between the ashpit and the hollow space under the pan.

This vault is used as a fire grate, the fuel (brown coal and small wood)

being inserted by the fire-door in the front wall. The air-draught

necessary for burning the fuel enters partly by the fire-door, partly

through the ashpit and the openings left in the vaulted grate. Through

these same openings the ashes and cinders are from time to time pushed

down into the ashpit, for which purpose small openings are left in the

side-wall of the furnace, through which the rakes may be introduced. A

passage in the back wall supporting the pan leads off the products of

combustion and the hot air into a short flue, sloping upwards, and

ending in a short vertical chimney. At the lower part some iron kettles

are placed in the flue for the purpose of heating the lye before it is

ladled into the evaporating pan.

With reference to the pan, it is made in a way that requires a great

deal of skill and practice. In the first place, beams reaching from the

one side to the other are laid on the top of the furnace walls, and are

covered with wooden boards, forming a temporary floor. Two or three feet

above this floor a strong horizontal network of poles of wood sustains a

number of straw ropes, with iron hooks hanging down, and of such a

length that the hooks nearly touch the wooden floor. The floor is

thereupon covered with a mixture of clay and small stones, 4 to 5 inches

thick, the workman being careful to incrustate the iron hooks into this

material. It is allowed to dry gradually, and when considered

sufficiently hardened, the wooden beams and flooring are removed with

the necessary precautions. The bottom of the pan remains suspended by

means of the ropes. The open spaces left all round between the bottom

and the top of the furnace walls are then filled up, and the border of

the pan, 9 inches to 10 inches high, is made of a similar mixture. It is

said that this extraordinary construction lasts from 40 to 50 days when

well made, and that it can be filled 16 times in 24 hours, with an

average of 500 litres of concentrated lye at each filling; but the

quantity depends upon the weather, and is less in winter than in summer.

During the cold season one pan yields 140 litres (of salt) each time it

is filled, and in the hot season from 190 to 210 litres. The average

consumpt of fuel is said to be 1500 kilos. in 24 hours.

In Persia, near Ballakhan, salt is still made, and has been made from

time immemorial, in a very primitive way, which is described by Bellen,

in his description of his journey in 1872 from the Indus to the Tigris,

as follows:--

“For several miles our road led over a succession of salt pits and

ovens, and lying about we found several samples of the alimentary salt

prepared here from the soil. It was in fine white granules massed

together in the form of the earthen vessel in which the salt had been

evaporated. The process of collecting the salt is very rough and simple.

A conical pit or basin, 7 or 8 feet deep and about 12 feet in diameter

is dug, and around it are excavated a succession of smaller pits, each

about 2 feet diameter by 1½ feet deep. On one side of the large pit

is a deep excavation, to which the descent from the pit is by a sloping

bank. In this excavation is a domed oven with a couple of fireplaces. At

a little distance off are the piles of earth scraped from the surface

and ready for treatment. And, lastly, circling round each pit is a small

water-cut led off from a larger stream running along the line of pits.

“Such is the machinery. The process is simply this:--A shovelful of

earth is taken from the heap and washed in the basins (a shovelful to

each) circling the pit.

“The liquor from these is, whilst yet turbid, run into the great central

pit, by breaking away a channel for it with the fingers. The channel is

then closed with a dab of clay, and a fresh lot of earth washed, and the

liquor run off as before; and so on till the pit is nearly full of

brine. This is allowed to stand till the liquor clears. It is then

ladled out into earthen jars, set on the fire and boiled to evaporation

successively, till the jar is filled with a cake of granular salt. The

jars are then broken, and the mass of salt (which retains its shape) is

ready for conveyance to market.

“Large quantities of this salt are used by the nomad population, and a

good deal is taken to Kandahar. The quantity turned out here must

annually be very great. The salt pits extend over at least ten miles of

the country we traversed, and we certainly saw some thousands of pits.”

From what I have laid before you, it will be seen that I am strongly of

opinion that we must go far beyond the time of Geber or the Arabian

school for the origin of our science. The study of the question of its

antiquity leads up to such remote times that there is little probability

of any date being assigned to its beginning, and to some it may appear

but a waste of time to indulge in researches upon the subject; but it

has a fascination peculiar to itself, and, in addition, brings before

our minds so many phases in the philosophical thought of the world, that

it will no doubt long continue to exercise the minds and attract the

attention of chemists.

In the course of my own study of the subject, I have felt much

dissatisfied with the derivation of the name chemistry or alchemy, as it

is given in all works to which I have had access. It is said to be

derived from a word meaning dark, hidden, black, and from the ancient

name for Egypt, but to my own mind this is an unsatisfactory

explanation, and seeking for another more consonant with the character

of the science, I think I have found it in quite a different direction.

It is well known that in the old Hindoo philosophy there were recognized

five elementary bodies or rather types. These were Water, Fire, Ether,

Earth, and Air, and the system of Menu, of which the antiquity is

enormous, recognizes as the greatest conception of the universe--

1st, God.

2nd, Mind.

3rd, Consciousness.

4th, Matras.

5th, Elements.

(matras being the invisible types of the visible atoms which compose the

five elements previously named--viz., Water, Fire, Ether, Earth, and

Air).

Now, these elements, with the sun and moon, composed the attributes of

the dual deity Iswara and Isi, representing the male and female natural

powers, and, applying this to the famous Pythagorean triangle, we find

that the upright symbol or male, which was the number or power 3, when

combined with the female prostrate symbol, which was the number or power

4, gives a product in the Hypotenuse of 5, which is the number of the

typical elements of the oldest known Hindoo philosophy. It is also the

product of the first male and female numbers, and was anciently called

the number of the world--repeated anyhow by an odd multiple it always

reappears.

If now we consider chemistry as that science which has to deal with the

changes and combinations of the five elements, and if we call it--

\_The science of the five parts or elements\_, should we not, when we find

that the Arabic word for five is \_khams\_, rather refer the name of our

science to this word khams, and read it as

\_Al-Khams\_,

The five-part science?

I am inclined, however, to go yet a step further, and remembering that

the \_fifth\_ element or Ether of the most ancient Hindoo philosophy, was

in reality an expression for active force, or, that emanating from the

central sun caused the natural phenomena of attraction and repulsion,

the emission and refraction of light, and other sensible changes of

condition, would read the compound word

\_Al-Khamis\_

(The fifth),

as the grand and simple title of our ancient science, meaning

\_The force\_--

that which causes the changes in the elementary types and their

combinations--than which no more descriptive title could be assigned to

it, even in the present enlightened age.

\* \* \* \* \*

\* \* \* \*

\* \* \* \* \*

Errors and Anomalies

Apollonius Tyanæus [\_text reads “Appolonius”\_]

Hercules and Bacchus (Dionysius) [\_text reads “Dionsyius”\_]

Ommiades ... Abassides [\_standard spellings for this text\_]

Ibn Osaibe’s testimony [\_text reads “Ibu”\_]

body-physicians at the Court of Harun-al-Raschid

[\_spelling as in original, but elsewhere spelled “Haroun”\_]

Xenophon in his Anabasis [\_text reads “Zenophon”\_]

Megasthenes [\_text reads “Megesthenes”\_]

the first of the Grecian philosophers [\_text reads “philosphers”\_]

the Hindoos believe in \_fourteen Menus\_

[\_and six further occurrences of “Menu”\_]

[\_standard spelling in this text: correct form is “Manu”\_]

Libyans in war chariots with four horses [\_text reads “Lybians”\_]

under the reign of Pharoah Necho [\_spelling as in original\_]

from the Red Sea to the Mediterranean [\_text reads “Mediterreanean”\_]

Jackson in his “Antiquities” tells us that, [\_comma in original\_]

♁ Denotes a chaos

[\_The symbol should look like an inverted “female” or “Venus”--

a cross above a circle-- but some fonts represent it as a cross

within a circle.\_]

Indra instructed Dahnwantari

Dahnwantari is also styled Kasi-rajah

[\_correct form is “Dhanwantari”\_]

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