it into a separate science. Musa, above mentioned, was the author of a "Treatise on Spherical Trigonometry." Al-Baghadadi left one on land-surveying, so excellent, that by some it has been declared to be a copy of Euclid's lost work on that subject.

In astronomy, they not only made catalogues, but maps of the stars visible in their skies, giving to those of the larger magnitudes the Arabic names they still bear on our celestial globes. They ascertained, as we have seen, the size of the earth by the measurement of a degree on her surface, determined the obliquity of the ecliptic, published corrected tables of the sun and moon, fixed the length of the year, verified the precession of the equinoxes. The treatise of Albategnius on "The Science of the Stars" is spoken of by Laplace with respect; he also draws attention to an important fragment of Ibn-Junis, the astronomer of Hakem, the Khalif of Egypt, A. D. 1000, as containing a long series of observations from the time of Almansor, of eclipses, equinoxes, solstices, conjunctions of planets, occultations of stars—observations which have cast much light on the great variations of the system of the world. The Arabian astronomers also devoted themselves to the construction and perfection of astronomical instruments, to the measurement of time by clocks of various kinds, by clepsydras and sun-dials. They were the first to introduce, for this purpose, the use of the pendulum.

In the experimental sciences, they originated chemistry; they discovered some of its most important reagents—sulphuric acid, nitric acid, alcohol. They applied that science in the practice of medicine, being the first to publish pharmacopœias or dispensatories, and to include in them mineral preparations. In mechanics, they had determined the laws of falling bodies, had

ideas, by no means indistinct, of the nature of gravity; they were familiar with the theory of the mechanical powers. In hydrostatics they constructed the first tables of the specific gravities of bodies, and wrote treatises on the flotation and sinking of bodies in water. In optics, they corrected the Greek misconception, that a ray proceeds from the eye, and touches the object seen, introducing the hypothesis that the ray passes from the object to the eye. They understood the phenomena of the reflection and refraction of light. Alhazen made the great discovery of the curvilinear path of a ray of light through the atmosphere, and proved that we see the sun and moon before they have risen, and after they have set.

The effects of this scientific activity are plainly perceived in the great improvements that took place in many of the industrial arts. Agriculture shows it in better methods of irrigation, the skillful employment of manures, the raising of improved breeds of cattle, the enactment of wise codes of rural laws, the introduction of the culture of rice, and that of sugar and coffee. The manufactures show it in the great extension of the industries of silk, cotton, wool; in the fabrication of cordova and morocco leather, and paper; in mining, casting, and various metallurgic operations; in the making of Toledo blades.

Passionate lovers of poetry and music, they dedicated much of their leisure time to those elegant pursuits. They taught Europe the game of chess; they gave it its taste for works of fiction—romances and novels. In the graver domains of literature they took delight: they had many admirable compositions on such subjects as the instability of human greatness; the consequences of irreligion; the reverses of fortune; the origin, duration,

and end of the world. Sometimes, not without surprise, we meet with ideas which we flatter ourselves have originated in our own times. Thus our modern doctrines of evolution and development were taught in their schools. In fact, they carried them much farther than we are disposed to do, extending them even to inorganic or mineral things. The fundamental principle of alchemy was the natural process of development of metalline bodies. "When common people," says Al-Khazini, writing in the twelfth century, "hear from natural philosophers that gold is a body which has attained to perfection of maturity, to the goal of completeness, they firmly believe that it is something which has gradually come to that perfection by passing through the forms of all other metallic bodies, so that its gold nature was originally lead, afterward it became tin, then brass, then silver, and finally reached the development of gold; not knowing that the natural philosophers mean, in saying this, only something like what they mean when they speak of man, and attribute to him a completeness and equilibrium in nature and constitution—not that man was once a bull, and was changed into an ass, and afterward into a horse, and after that into an ape, and finally became a man."

CHAPTER V.

CONFLICT RESPECTING THE NATURE OF THE SOUL. — DOCTRINE OF EMANATION AND ABSORPTION.

European ideas respecting the soul.—It resembles the form of the body.
Philosophical views of the Orientals.—The Vedic theology and Buddhism assert the doctrine of emanation and absorption.—It is advocated by Aristotle, who is followed by the Alexandrian school, and subsequently by the Jews and Arabians.—It is found in the writings of Erigena.
Connection of this doctrine with the theory of conservation and correlation of force.—Parallel between the origin and destiny of the body and the soul.—The necessity of founding human on comparative psychology.
Averroism, which is based on these facts, is brought into Christendom through Spain and Sicily.
History of the repression of Averroism.—Revolt of Islam against it.—Antagonism of the Jewish synagogues. — Its destruction undertaken by the papacy.—Institution of the Inquisition in Spain.—Frightful persecutions and their results.—Expulsion of the Jews and Moors.—Overthrow of Averroism in Europe.—Decisive action of the late Vatican Council.

The pagan Greeks and Romans believed that the spirit of man resembles his bodily form, varying its appearance with his variations, and growing with his growth. Heroes, to whom it had been permitted to descend into Hades, had therefore without difficulty recognized their former friends. Not only had the corporeal aspect been retained, but even the customary raiment.

The primitive Christians, whose conceptions of a future life and of heaven and hell, the abodes of the

blessed and the sinful, were far more vivid than those of their pagan predecessors, accepted and intensified these ancient ideas. They did not doubt that in the world to come they should meet their friends, and hold converse with them, as they had done here upon earth —an expectation that gives consolation to the human heart, reconciling it to the most sorrowful bereavements, and restoring to it its dead.

In the uncertainty as to what becomes of the soul in the interval between its separation from the body and the judgment-day, many different opinions were held. Some thought that it hovered over the grave, some that it wandered disconsolate through the air. In the popular belief, St. Peter sat as a door-keeper at the gate of heaven. To him it had been given to bind or to loose. He admitted or excluded the spirits of men at his pleasure. Many persons, however, were disposed to deny him this power, since his decisions would be anticipatory of the judgment-day, which would thus be rendered needless. After the time of Gregory the Great, the doctrine of purgatory met with general acceptance. A resting-place was provided for departed spirits.

That the spirits of the dead occasionally revisit the living, or haunt their former abodes, has been in all ages, in all European countries, a fixed belief, not confined to rustics, but participated in by the intelligent. A pleasing terror gathers round the winter's-evening fireside at the stories of apparitions, goblins, ghosts. In the old times the Romans had their lares, or spirits of those who had led virtuous lives; their larvæ or lemures, the spirits of the wicked; their manes, the spirits of those of whom the merits were doubtful. If human testimony on such subjects can be of any value, there is

a body of evidence reaching from the remotest ages to the present time, as extensive and unimpeachable as is to be found in support of any thing whatever, that these shades of the dead congregate near tombstones, or take up their secret abode in the gloomy chambers of dilapidated castles, or walk by moonlight in moody solitude.

While these opinions have universally found popular acceptance in Europe, others of a very different nature have prevailed extensively in Asia, and indeed very generally in the higher regions of thought. Ecclesiastical authority succeeded in repressing them in the sixteenth century, but they never altogether disappeared. In our own times so silently and extensively have they been diffused in Europe, that it was found expedient in the papal Syllabus to draw them in a very conspicuous manner into the open light; and the Vatican Council, agreeing in that view of their obnoxious tendency and secret spread, has in an equally prominent and signal manner among its first canons anathematized all persons who hold them. "Let him be anathema who says that spiritual things are emanations of the divine substance, or that the divine essence by manifestation or development becomes all things." In view of this authoritative action, it is necessary now to consider the character and history of these opinions.

Ideas respecting the nature of God necessarily influence ideas respecting the nature of the soul. The eastern Asiatics had adopted the conception of an impersonal God, and, as regards the soul, its necessary consequence, the doctrine of emanation and absorption.

Thus the Vedic theology is based on the acknowledgment of a universal spirit pervading all things. "There is in truth but one Deity, the supreme Spirit; he is of the same nature as the soul of man." Both the