

The Open Court

A MONTHLY MAGAZINE

Devoted to the Science of Religion, the Religion of Science, and the Extension of the Religious Parliament Idea

Editor: DR. PAUL CARUS.
Assistant Editor: T. J. McCORMACK.

Associates: { E. C. HEGELER.
MARY CARUS.

VOL. XIV. (NO. 7) JULY, 1900. NO. 530

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NICOLAUS COPERNICUS.

(1473-1543)

From a picture in the possession of the Royal Society, presented by Dr. Wolf of Dantzic June 6, 1776. Engraved by E. Scriven

Frontispiece to *The Open Court*

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COPERNICUS, TYCHO BRAHE, AND KEPLER.¹

BY CARUS STERNE.

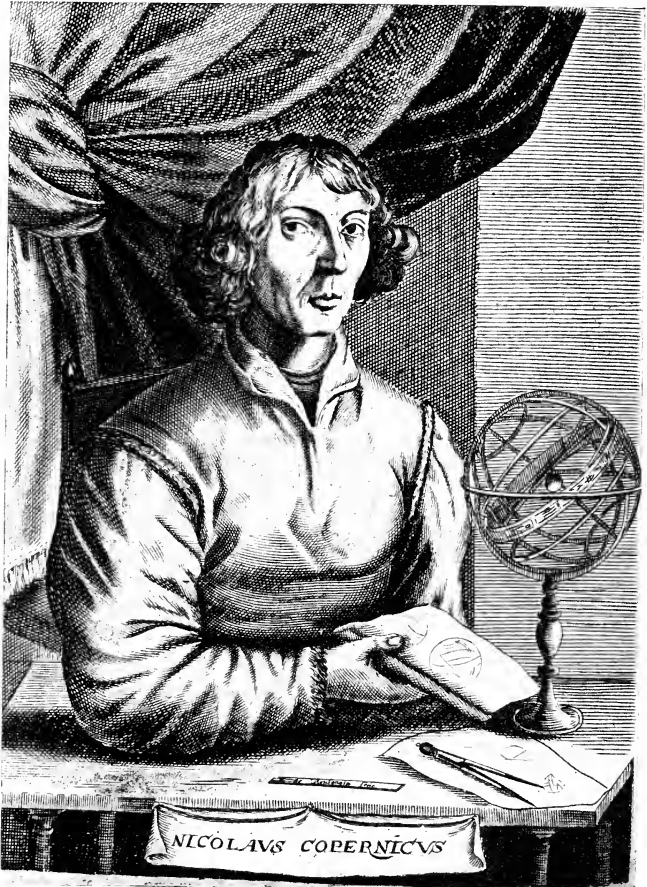
IF we review the long line of fighters who freed the human mind from the oppressive bonds of its early subjection, two investigators, Copernicus and Kepler, always stand out prominently as leaders. These men, however, did not stand in the fore-front of battle; they worked in comparative obscurity; but they rank as real leaders through the weight of their investigations, and through the irresistible force of the proofs obtained by their patient observation of nature.

Although originally destined for the priestly office, each rose above the narrow principles of Church doctrine as received in theological lecture-rooms. Nor must it be forgotten that the Protestant camp from which Kepler came was at that time quite as intolerant as the Catholic, as witness the case of Michael Servetus, discoverer of the circulation of the blood. Indeed at the time of the rise of Copernicus, the Church of Rome felt itself still so firm and unshaken in its sense of power, that it believed it might grant considerable liberty in the observation and explanation of nature.

It must not be forgotten that a long time before Copernicus the old belief in the geocentric system was shaken, but the Church then acted as though this was a matter of no concern to her. Nicholas Krebs of Cusa (1401-1464) had made no secret of his conviction that the earth moves, and yet several popes had advanced him to the highest offices in the Church. Leonardo da Vinci speaks repeatedly, in his written notes, of the movement of

¹Translated from the German by Dr. David Eugene Smith, of the State Normal School Brockport, N. Y. The publishers are also indebted to Dr. Smith for having courteously placed at their disposal the originals of the portraits which adorn the present article. For the remaining illustrations they are under obligations to W. Engelmann, of Leipsic.

the earth as a matter of course. But all these views, differing from the prevailing teaching, had been only philosophical speculations



FROM AN OLD PRINT. A SCIENTIFIC INTERPRETATION.

which in part were awakened by the study of classical authors, in part were clarified by independent reflexion, yet did not rest upon

the foundation of thorough observations. To have made such supporting and confirming observations, with the simplest instruments and with untiring patience, remains the undying merit of Copernicus (1473-1543).

Through his uncle Lucas von Watzelrode, Bishop of Ermland, Copernicus was led to the priestly office, although in Cracow, besides his theological work, he was interested in mathematical and astronomical studies, in which Albert Bruzewsky was his teacher. The youth of twenty-three continued these many-sided occupations in Bologna, then the indispensable source of scientific knowledge. Insatiable in his thirst for learning, he then went to Padua where he added medical studies to the theological, mathematical, and astronomical which he had already pursued. From Rome, where he received a professorship at the university in 1500, our scholar, who apparently cared little for splendor and fame, returned to his bleak northern home. Here he obtained, through the mediation of his uncle, a position as canon in Frauenburg (1510), which allowed him to prosecute his astronomical researches in all tranquillity.

Since the year 1507 the thought had come to him and had become more and more fixed, that the old geocentric idea was false. Finally, through unremitting observations, he became convinced of the movement of the earth and the planets round the sun, not publishing his views, however, save to friendly astronomers or to amateurs, many of whom flocked to him for instruction and for the removal of their doubts. Copernicus possessed a universal mind similar to that of Leonardo da Vinci, a mind which seemed to succeed in all it undertook. He therefore was able to carry on the government of the Chapter after the death of his uncle, to appear as its representative at the Prussian diet, to undertake the regulation of the Prussian system of minting and coinage, to carry on the work of a popular physician in his district, and to advance to successful conclusion a difficult construction of some flood-gates. Just as thoroughly and systematically did he proceed in his observations of the heavens, so that his undying services to astronomy are in nowise prejudiced by such predecessors as Nicholas von Cusa. The views of the latter were still so confused that he seems never to have drawn even the most important of the consequences of the movement of the earth, namely, the immobilising of the sphere of the fixed stars.

In the year 1530 the great work of Copernicus, *On the Revolution of the Heavenly Bodies* (*De revolutionibus orbium coelestium, libri*

VII.), was finished in outline,—a work which prepared the way for a great revolution in thought. Of this work the Archbishop of Capua, Nicholas von Schönberg, who was of German extraction, and one of the sincerest admirers of Copernicus, is said to have received a manuscript copy in 1536. This good patron also encouraged Copernicus to publish the work, its contents being already so much talked of in learned circles. He is also said to have borne

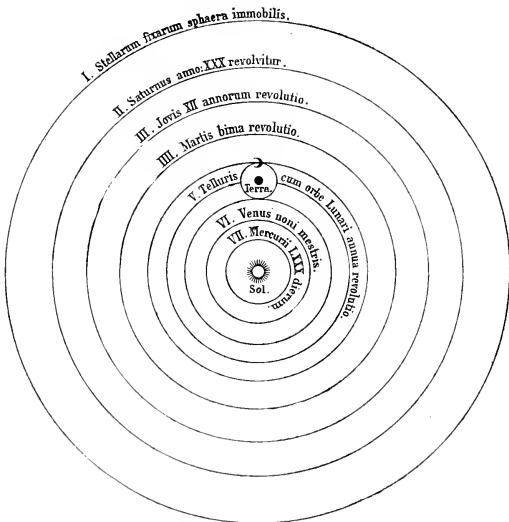


DIAGRAM OF THE COPERNICAN SYSTEM.

From Copernicus's work, *De revolutionibus* (1530).¹

Copernicus says: "The first and highest of all the spheres is that of the fixed stars, enclosing itself and the others and therefore immovable, being the place of the universe to which the motion and position of all the other stars are referred. Then follows the outermost planet, Saturn which completes its revolution round the sun in thirty years [the planets, Uranus and Neptune had not yet been discovered]; then Jupiter, which has a period of twelve years; then Mars, with a period of two years. The fourth sphere in order is that of the yearly revolution, and in it is contained the earth, having the orbit of the moon as an epicycle; in the fifth place, Venus revolves in nine months; the sixth place is occupied by Mercury, which performs its revolution in a period of eighty days. In the middle of all stands the sun: for who could think of another or better place in this most beautiful temple for so brilliant a luminary? The sun, thus, seated on its kingly throne, guides the movements of the stars that circle round it."

the cost of printing, and to have recommended the dedication of the work to Pope Paul III., one of the most ardent admirers of

¹ Reproduced from a cut in Friedrich Dannemann's *Grundriss einer Geschichte der Naturwissenschaften*, 2 vols. Leipzig: W. Engelmann.

astronomy. It was therefore probably scientific caution, rather than apprehension as to its reception by the Church authorities, that led Copernicus to defer so long the publication of this work. This is the more probable because, only a short time before (1533), the German astronomer Widmansstedt, who held similar views, had met with a kind reception from Pope Clement VII.

That he would find manifold and lively opposition among

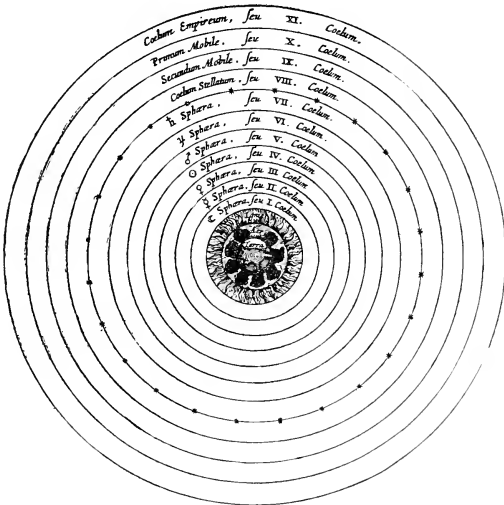


DIAGRAM OF THE PTOLEMAIC SYSTEM OF THE UNIVERSE (160 A. D.).

From Guericke's *De vacuo spatio*. (After Dannemann).

Reproduced for comparison with the system of Copernicus. The first sphere contains the moon, which has a period of revolution of one twelfth of a year; the second contains Mercury having a period of one fourth of a year; the third Venus, having a period of two thirds of a year; the fourth the sun, having a period of one year; the fifth Mars, having a period of two years; the sixth Jupiter, having a period of twelve years; and the seventh Saturn, having a period of thirty years.

Catholic and Protestant scholars and laymen, Copernicus must have understood from the very beginning. It is, however, remarkable that the first attacks of the Protestant spokesmen were almost more violent than those of the Catholic, and this may have been brought about by the well-received dedication to the Pope. It is known that Luther was one of the most determined opponents of the theory, and in the *Table-Talk* he says of the Canon of Frauenburg with little consideration :

"Mention was made of a contemporary astrologer who tried to prove that the Earth moved and turned round, but not the Heavens, nor the Firmament, nor the



DOMINVS NICOLAVS COPERNICVS, SACERDOS, CANONICVS
REGVLARIS, ASTRONOMICORVM KORYPHÆVS.

*Ex Authenticis Prototypis Erasmi Pomeholdii. COPERNIC Tractat Terræ, Lunæ quæ Libres,
Sidus, Menirat Pugas, Abstrusa quæ Pundit Faciebat I Miltandur Chawahifi a Moncornet Excudit*

FROM AN ORIGINAL CLAIMED TO BE AUTHENTIC. AN ECCLESIASTICAL
INTERPRETATION.

Sun, nor the Moon; just as when a person is seated in a wagon or on a boat and is in motion, and fancies he is sitting still and at rest while the earth and the trees are moving. But this is the way of the world now: when a person is bent on being

thought clever, he must perforce make up something of his own, which has to be the best that is, just as he makes it. This fool will upset the whole Science of Astronomy. But the Holy Scriptures tell us, Joshua bade the *Sun* stand still and not the Earth."

One may well think from this that Luther followed the views of his friend Melanchthon, who was an ardent adherent of astrology, a science which remained, as we shall presently see, closely bound up with the geocentric theory. Luther, however, believed less firmly in astrology, and several times even declaimed vehemently against it, so that the accusations brought against him, that he made use of the astrological superstition of the time for his own ends, is probably not tenable.

Naturally there was no lack of satirical inuendoes against the new theory of Copernicus, which had become known long before the appearance of his work. To such attacks on the part of meddling critics Copernicus addresses himself in the dedicatory letter to Pope Paul III., published before the work appeared. Here he speaks, in a tone of perfect confidence, of those vain babblers who, without possessing mathematical knowledge of their own, would condemn his work because it was at variance with a few purposely distorted passages in the Bible. Thus did the holy Lactantius, in his ignorance, once childishly scoff at the spherical form of the earth; but the learned must overlook with contempt such objections of non-mathematicians. Just as boldly did he oppose prevailing prejudices by his eulogy of the new system, delivered with noble pride and self-confidence: "Through no other arrangement," he says, "have I been able to find such wonderful symmetry of the universe and such harmonious connexion of the orbits, as when I place the sun, the light of the world, as ruler of the whole family of circling stars in the midst of the high temple of nature, as though upon a kingly throne. Who indeed could find in all glorious nature a better place for the sun than that from which it can give light to the whole?"

It will be seen that in his works, which were finally given to the press, appearing however only after his death (which occurred on the following May 24), Copernicus spoke out with manly firmness for the truth of the results of his investigations. It is evident, too, that the supposition that he was spared by the ecclesiastical censor only because one of the editors (Andreas Osiander) had sent out in advance an anonymous preface, could be true only on the hypothesis that the censors had read neither the dedication to the pope nor the work itself. This preface of Osiander designated

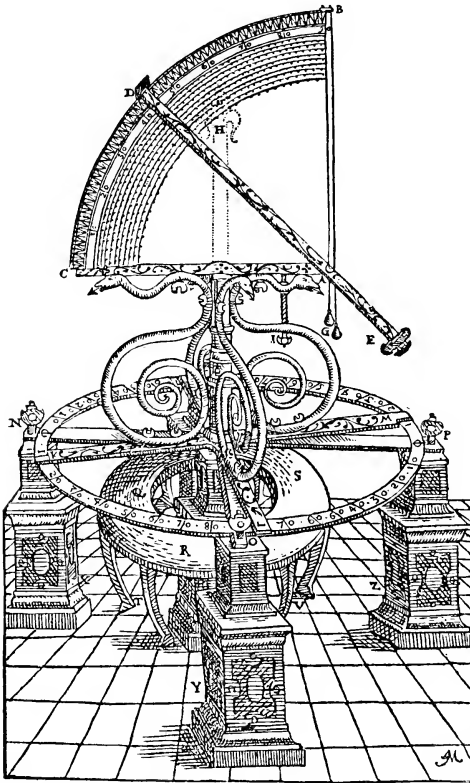


TYCHO BRAHE.

(1546-1601.)

(From a very rare print.)

the new doctrine as a mere hypothesis which "need be neither true nor probable," as it was to serve only to calculate more easily the phenomena of the heavens, and it is not probable that it was



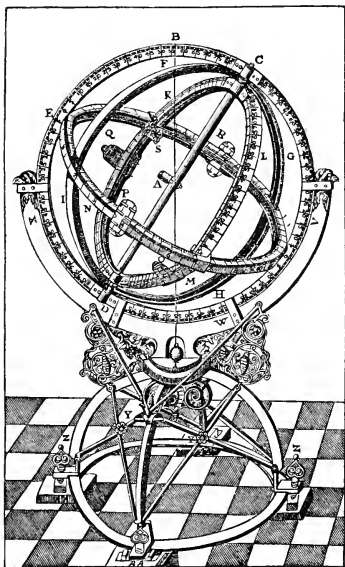
ALTAZIMUTH OF TYCHO BRAHE, THE ARCHETYPE OF THE MODERN THEODOLITE
(From Tycho Brahe's *De mundi aetherei*, Prague, 1603. After Dannemann.)

This beautiful instrument was constructed of brass and served for determining both azimuths and altitudes. The azimuth-circle, *NP*, rested on four pillars; the altitude-circle had a radius of almost two yards, and was provided with a scale of minutes, *BC*, and an alidade, *DE*.

added with the consent of Copernicus. He could not, however, protest against what had been done, as he received the first copy only on his death-bed.

The great successor of Copernicus in the field of observation was the Danish nobleman Tycho Brahe. In the estimation of the world he generally passes for the outspoken opponent of Copernicus, and as the inventor of a new cosmology which left the earth in the center of the universe, and made the sun and moon revolve around it, but the planets around the sun,—a system which has

been explained as a concession to the prevailing belief. But the traditional estimate of this admirable investigator, who pursued his studies in Leipsic, Wittenberg, and Augsburg, is a very unjust one. In point of fact, he was the most ardent admirer of Copernicus that could be imagined. In the Sternenburg (Uranienburg) which his royal patron Frederick II. of Denmark had constructed for Tycho Brahe on the island Hveen, the picture of the Canon of Frauenburg, adorned with palms and laurels, occupied the place of honor in the room of state. When the heirs and successors of Copernicus heard of this worship, they sent as a gift the simple wooden instrument with which the latter had made his observations. Tycho celebrated the happy day of its reception (July 13, 1584) by



ARMILLARY SPHERE OF TYCHO BRAHE.¹

This instrument, like all the others of the great Danish astronomer, was manufactured in Tycho Brahe's own workshop. The elegance and exactitude with which they were executed in every detail, are beautifully shown by this illustration.

a Latin poem, in which it is said of Copernicus :

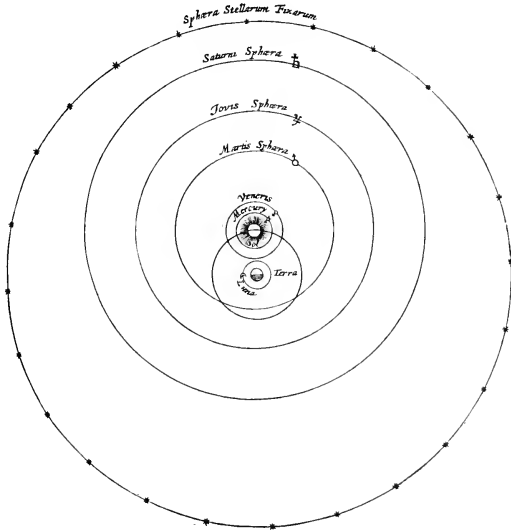
“ He succeeded in snatching the sun from the heavens,
And placing it firmly. Around it then he guided the earth,
As around the earth the moon.”

And of the instrument, which had no lenses :

¹From Gerland and Traumüller, *Geschichte der physikalischen Experimentirkunst*, Leipsic W. Engelmann.

“ . . . O monument of the great
 And immortal man! You are perishable wood,
 But shining gold will look on you with envy.”

But Tycho had so improved this instrument, although he likewise had to do without lenses, and he was besides so sharp an observer, that he could not but perceive the defects still adhering to the Copernican system as well as the discrepancies between the facts and the calculations based upon it. Untiring observations of the orbit of Mars showed clearly that the *circles* assumed as the



TYCHO BRAHE'S SYSTEM OF THE UNIVERSE. (1587.)

This system occupies an intermediary place between the geocentric system of Ptolemy and the heliocentric system of Copernicus. In Tycho's system the earth is at the center; the sun, Mars, Jupiter, and Saturn revolve about the earth, while Mercury and Venus perform secondary epicyclical revolutions about the sun. (From Guericke's *De vacuo spatio*. After Dannemann.)

planetary orbits by Copernicus did not exist. Furthermore, Tycho found good reason to deny the third movement of the earth (around the pole of the ecliptic) presupposed by Copernicus. Hence he is not to be blamed if he held provisionally to his own system, which had in common with the ecclesiastical conception the geocentric idea only; for naturally he had never doubted the revolution of the earth on its axis.

Neither did Tycho Brahe ever publicly set up his system in opposition to that of Copernicus. His theory was not published until three years after his death, in a book appearing in Frankfort in 1604; and the essay contained in it "On the System of the Universe" is, probably with good reason, attributed to his pupil B. Ursus. The fruits of Tycho's labors did not ripen until later, after Kepler was able to build further on the foundation of these observations, the most exact that any astronomer had made before the discovery of the telescope.

Johannes Kepler (born December 27, 1571) was on account of his weak frame, like Copernicus, originally destined for the ministry; or rather we may say he had grown up into it, for his parents, having ended after various vicissitudes in life in keeping a tavern, had placed the boy in the school attached to the monastery of Hirsau. From there he went to the school of the former Cistercian monastery Maulbronn, where in 1516 Dr. Faust is said to have taught Abbot Entenfuss alchemy and to have passed the last years of his life. We might believe that something of the Faust-spirit there descended upon the young man, who later removed to the seminary of Tübingen (1589) in order to study Protestant theology.

Kepler fortunately found at Maulbronn a fatherly friend and adviser in Michael Mästlin, a theologian versed in astronomy and an adherent of Copernicus. It is he whom Galileo also honored as a teacher, and who inspired Kepler with all the more interest for astronomy as his warm attachment to theology was repulsed by the extreme views of most of the other teachers there. In particular Kepler would not profess Luther's dogma of the omnipresence of the body of Christ, and as he was already suspected on account of his fondness for the stars, he seems to have been in a difficult position. Probably also he did not understand keeping his conviction of the truth of the Copernican system as secret as was necessary, as his cautious and timid teacher had done for years and also recommended to him. Accordingly serious conflicts soon arose, and Mästlin as well as several other teachers advised Kepler to give up his theological studies entirely and accept a position as teacher of mathematics at the Gymnasium at Graz, which was to be filled in the spring of 1594. Kepler, who was a zealous Protestant, even though not according to the strict Lutheran fashion, went unwillingly to the Catholic country, but he accommodated himself to circumstances and supplied the Styrian provincial almanac with all the astrological lumber which was at that time deemed to be the main requisite of a calendar.

It is remarkable and at the same time instructive to observe how Kepler, with his strong inclination to fantastic dreaming and



*Ecce Mathematicum KEPLERUM Caesaris olim
 Eximium, facies cuius in aere micat.*

mmf

JOHANN KEPLER. (1571-1630).

Probably from contemporary sources.

to poetical ideas of things in general and their relations, wrested himself almost entirely free from the seductive allurements of the astrological craze of that time. It was apparently, next to his

mathematical vein, his religious conviction of the perfection of the structure of the universe that kept him from this aberration. The words of the Bible, that the universe is duly disposed according to number, measure, and weight,¹ which more than two hundred years later led the chemist of the Berlin porcelain factory, J. B. Richter, to the discovery of the stoichiometric relationships between the chemical elements, impelled him also to seek *the mathematical law of the structure of the universe*.

Led astray on this quest by his classical education, he first took up with the speculations of the Pythagoreans, who had alternately compared the five regular solids to the five worlds and to

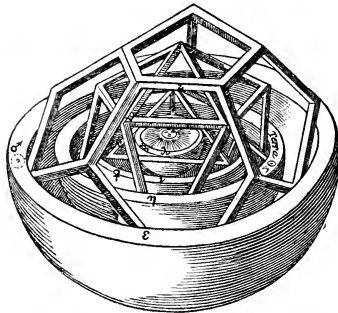


Fig. 1.

KEPLER'S CONSTRUCTION OF THE PLANETARY SPHERES.

Exhibiting the dimensions and distances of the planetary orbits by means of the five Platonic solids. (From Kepler's *Mysterium Cosmographicum*, Tübingen 1596. After Dannemann.)

Kepler says; "The orbit of the earth gives the circle which constitutes the measure of all the others. About this circle (η in the figure) describe a dodecahedron; in the sphere which encloses this solid lies the orbit of Mars (ϵ in the present figure). About the Martian sphere describe a tetrahedron; the spherical surface described about this solid would contain the orbit of Jupiter (see γ in Fig. 2). Describe about the latter a cube; the sphere enclosing the cube (α , Fig 2. contains the orbit of Saturn. Further, construct within the terrestrial sphere an icosahedron; the spherical surface inscribed within the same contains the orbit of Venus (ι in the present figure). Describe within this last sphere an octahedron, and this body will enclose the sphere Mercury."

the five senses of man, and conjectured that by them possibly the five spaces between the six planetary orbits might be typified. He accordingly imagined the octahedron, icosahedron, dodecahedron, tetrahedron, and cube, placed successively one within another, with the sun at the center; and describing spheres between each

¹ Wisdom, II, 22.

two successive solids to touch the outer angles of the smaller and the inner surfaces of the larger, he conceived the great circles of these spheres to represent the orbits of the planets, and the spaces between them the distances of the orbits.

The unit for the orbit-distances was given by the orbit of the earth, which was assumed to be on the sphere between the icosahedron and the dodecahedron.

This device, when closely examined, will be found not unworthy of a poetising mathematician. As the mean distances of the orbits of the planets, not then known with the strictest accu-

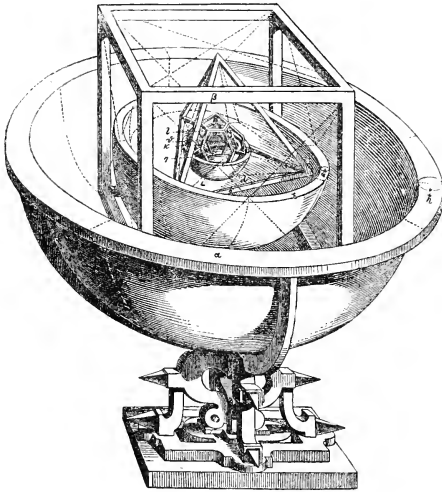


Fig. 2.

KEPLER'S CONSTRUCTION OF THE PLANETARY SPHERES.

(For description see Fig. 1.)

α =the sphere of Saturn; β =the cube; γ =the sphere of Jove; δ =tetrahedron; ϵ =sphere Mars; ζ =dodecahedron; η =the sphere of the earth; θ =the icosahedron; ι =sphere of Venus; κ =octahedron; λ =the sphere of Mercury; μ =the sun.

racy, corresponded fairly well with those reckoned in this way, he was convinced that he had discerned the skilful plan of the architect of the universe, and accordingly he made known this cosmical secret in his maiden work, the *Mysterium cosmographicum* (1596).

Genuine enthusiasm for the perfection of creation as revealed by Copernicus had furnished the original incentive for all Kepler's

calculations and investigations, and so he begins his work with the following words :

"Inspired, full of holy joy, David cries aloud, calling upon the world itself : 'Praise ye him, sun and moon : praise him all ye stars of light.' But what voice has been bestowed upon the heavens, and what upon the stars, fit to praise God like that of man? Because they give reasons for praising God, we may say, they praise God himself. Since then we are endeavoring to make this voice of the heavens and of all nature more perceptible and clear, let no one say we are pursuing vain studies or exerting ourselves for naught."

After interpreting, as far as in him lies, this marvellous construction, and emphasising the lack of a planet between the orbits of Mars and Jupiter, his enthusiasm breaks forth once more in a lofty hymn, a few lines of which may here be quoted :

"Great Artist of the universe, with admiration I look upon the works
Of thy hands, which constructed them according to an ingenious plan.
In their midst the sun, dispenser of light and life,
Which curbs the earth according to sacred law and guides her
In her changing course. I see the toil of the moon,
And stars scattered on the infinite meadow. . . .
Sovereign of the world! Thou eternal power! Thine infinite glory
Soars on the wings of light through all the worlds!"

The impression of this work, which to-day possesses value only as a poem and picture of the fancy, was a very mixed one. Kepler's Tübingen teachers were not in accord with it. "God forbid," Professor Hafenraffer wrote (1597) with discernment but with kindness, "that you should ever try publicly to bring your hypothesis into agreement with Holy Scriptures; act, I beg of you, entirely as a mathematician and do not disturb the repose of the Church."

But Galileo wrote an enthusiastic letter dated the fourth of August, 1597 :

"I consider myself happy to know of so great an ally in the search for truth and consequently such a friend of truth itself. It is really pitiful that there are so few who strive for the truth, and care to depart from perverted methods of philosophising. But this is not the place to lament the wretchedness of our time; rather should I wish you good luck in those splendid investigations, by which you strengthen the truth. . . . I should risk publishing my own speculations, if there were more like you. But since this is not the case, I postpone it, for fear of sharing the fate of our master Copernicus, who although he has won undying fame with a few, has nevertheless with very many—so great is the number of fools!—become an object of ridicule and contempt."¹

The work was of great advantage to Kepler in that it brought the young astronomer to the notice of Tycho Brahe of Prague, and

¹K. von Gebler, *Galileo Galilei und die römische Kurie*, Stuttgart, 1876.

caused him to invite Kepler to come to that place as his assistant. This was so much the more important for Kepler, as his position in Graz had in the meantime become untenable. In the year 1598 Archduke Ferdinand had, by an edict, banished all Protestant



JOHANN KEPLER.

From a picture in the collection of Godefroy Kraenner, merchant at Ratisbon.
Engraved by F. Mackenzie.

teachers and priests from Styria, and Kepler alone was allowed to remain, it was said through the intercession of the Jesuits, who needed his astronomical calculations for their missions in China. But in the year 1600 there was a repetition of the storm, and Kepler

might count himself happy in having found employment in the well-appointed observatory of the Hradšchin at Prague.

But his position there with the haughty Danish astronomer, busy with the improvement of the Copernican system, seems not to have been the most agreeable. Indeed it would probably have become unendurable, owing to the great difference of temperament of the two men, had not Tycho Brahe's unexpected and early death (on the 23d of October 1601) put an end to this unsatisfactory alliance. The result was that Kepler was raised to the position of the imperial astronomer and mathematician. Not without manifold difficulties, however, did he come into possession of the priceless results of his predecessor's observations, which were to serve in the calculation of the Rudolphine Tables (of the movements of the planets). This material was so much the more indispensable for Kepler's labors, because on account of the weakness of his eyes he would never have been able to acquire it for himself. And even now it would have gone badly with his mission, had not industry been aided by imagination, that freest daughter of the mind, which raised him above the preconceived but respectable errors of his master, driving him incessantly into new combinations and conjectures. Thus we see that not the gift of observation and the art of calculating alone suffice for the making of great discoveries, but that science often has still more to gain from the consistent working out of hypotheses. On the other hand, Kepler was always irresistibly impelled to check the creations of his imagination by calculation. But he was successful in doing this only in three discoveries, namely those relating to the movements of the planets, which were alone sufficient to have made his name immortal. He dreamed, however, of many another, which it remained for Newton, and even for Laplace, to furnish a firm support.

It was above all the irregularities which Tycho Brahe had established in the revolution of Mars that attracted the attention of Kepler, and he gave voice to the conviction that "through the planet Mars we must reach the secrets of astronomy, or remain forever ignorant in this science."

In the preface to the *New Astronomy or the Commentary on the Planet Mars* (1609) he gives an account to the Emperor Rudolph of the result of the "struggle with the heathen god of war, in which General Tycho Brahe won the highest fame, inasmuch as he discovered in the night-watches of twenty years all the habits, positions, and stratagems of his enemy. O that he [Kepler] might now bring this most noble lord a prisoner before the Emperor!"

Copernicus had, as was before mentioned, believed that the planets move in circles round the sun, and from this assumption had arisen the appearance of irregularities in these orbits. Kepler now perceived that Mars and the other planets moved not in circular but in elliptic orbits round the sun, which therefore is not in the center of the orbit, but in one of the foci (*Kepler's first law*). At the same time he perceived that the planet hurries forward faster in its orbit in perihelion than in aphelion, but that the radius of rotation describes equal areas in the same time in all portions of the orbit. (*Kepler's second law*.)

He did not hesitate, in spite of the opposition made hitherto by the Church, to announce openly these great discoveries, which, as he rightly assumed, removed the last difficulties from the Copernican system of the universe. Accepting the Joshua miracle, he says that Joshua merely expressed wrongly his prayer commanding the sun to stand still, just as we still every day express ourselves wrongly when we say we wish the sun would soon rise above the horizon. He adds :

"In theology the weight of authority may decide, in philosophy we must have reasons. Holy is Lactantius, who doubted the spherical form of the earth ; holy is Augustine, who conceded this but denied the existence of antipodes ; . . . but holier to me is truth, when I, with all respect for the Church, prove by science that the earth is round, is inhabited by antipodes, is a little dot in the universe, and wanders among the stars !"

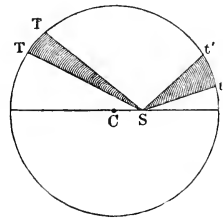


DIAGRAM ILLUSTRATING
KEPLER'S SECOND LAW.

If the distances t' and TT' are traversed in equal times, then the segments $t'S$ and $TT'S$ are equal in area.

Having now discovered in the law of areas a new confirmation of the structure of the universe according to number, he bent all his energies to find why the planets did not hasten round the sun with uniform swiftness in the more perfect circular orbit, but revolved, as he had found, with changing swiftness in elliptic orbits. Again it was a dream of the ancients that captivated his poet-soul, the Pythagorean dream of the harmony of the spheres, of the music of the universe, audible only to spirits specially blessed. By this means he hoped to reduce apparent anomalies to a mutual balance, to harmonise the courses of the planets, so that every dissonance which a single planet might produce when regarded outside of its connexion with the system, would be by such law removed from the celestial concert.

“Straying in this labyrinth of delusion,” as a stern critic of these ideas would say, “at last, at last,” he discovered on the 15th of May, 1618, at Linz, where he meanwhile had found a position as gymnasium professor, his third law. This is the law according to which the squares of the times of revolution of the planets are proportional to the cubes of the mean distances. This discovery followed upon a failure that calls to mind the discovery of universal gravity by Newton; for suddenly, as Kepler expresses himself, the perception of the truth triumphed “over the darkness of my mind with such conformity to my seventeen years’ work on the observations of Tycho, that I at first thought I was dreaming and that I had taken for granted that which I was seeking.”

Certain of his critics have utterly failed to comprehend this combination of dreaming and mathematical genius, and in regard to the discovery of the third law, have cried out: “Whence suddenly so much light after such deep obscurity?” (Bertrand.) They have also spoken of his gambler’s luck; but Whewell has pointed out, in his *History of the Inductive Sciences*, that this combination of imagination and penetration is the peculiar characteristic of most great discoverers. He further notes that Kepler is distinguished from most of the others only in that he describes at length his mistakes and aberrations in his search for the truth, and admits that truth would now hide herself from his gaze, and again incite him to pursuit, like Virgil’s Galatea:

“Galatea throws apples after me, the roguish maiden,
Then back she flies to the pastures, yet wishes first to be seen.”

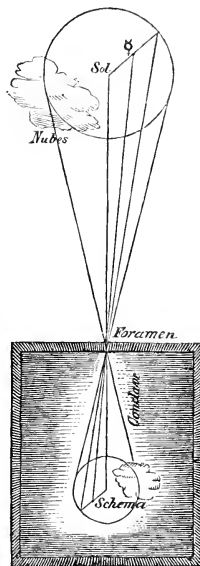
“We may be surprised,” says Reuschle,¹ at Kepler’s wonderful luck in disentangling truth from the wildest, most preposterous fancies; yet we *know* that with our hero the one is productive of the other, that both are strangely interwoven into a very singular whole.” We must also agree with what Reuschle has said about his poetical bent and the enthusiasm that always reanimated his courage when extended calculations threatened to wear out his spirit, or his dire poverty seemed about to prostrate him. All his life long he was obliged to beg of Tycho Brahe, as well as of the emperor and the empire, for the salary rightfully belonging to him and for the money to print his books. Indeed, he met his death while on a begging expedition, made on foot, in early winter, to the imperial diet at Regensburg, November 15, 1630. He had to struggle not only with the opponents of Copernicus and Tycho,

¹C. G. Reuschle, *Kepler und die Astronomie*, Frankfurt, 1871.

men like Chiaromonte, Riccioli, etc., but also with the most absurd prejudices of the people and with a fanatic priesthood. To add to all his misery, through the efforts of his own degenerate brother Christopher, his old mother was accused of witchcraft, so that she was saved from the stake only by the greatest exertions and after six years of legal contest.

Kepler was also forced incidentally to pay court to that "coquettish daughter of astronomy," astrology, both in Gratz and in Prague, in order to keep his court position and earn his living. This was done, however, with very little regard for her, and with bitter complaint that he must so play the charlatan. It all had its humorous side, however; he writes in one place: "This astrology is indeed a foolish little daughter, but—*lieber Gott!*—where would her mother, the highly rational astronomy, be, if she did not have this foolish offspring? The world is even more foolish, so foolish in fact, that this sensible old mother must for her own benefit cajole and deceive it, through her daughter's foolish, idle talk."

And although on the whole he was very fortunate in his prophecies, yet he says frankly: "Since the guessing is after all only a matter of Yes or No, we are sure to hit the mark half the time, and miss it only the other half. The successful guesses are remembered after the manner of women, but the failures are forgotten, because they are nothing peculiar, and so the astrologer is still held in honor." Even Wallenstein thought once of making Kepler his astrologer, and met him in Sagan, after he had lost his professorship in Linz through the expulsion of the protestants under Ferdinand II. But Wallenstein saw very well that Kepler did not believe in his own prophecies



KEPLER OBSERVES A SUN-SPOT WHICH HE ERRONEOUSLY TAKES FOR MERCURY.¹

¹*Opera Omnia*, II., 793. After Dannemann. This observation was made in 1607, before the invention of the telescope. Tradition, dating from the days of Charlemagne, asserted Mercury to be visible, when in conjunction, as a minute dark spot on the surface of the sun. Allowing the rays of the sun to pass through a narrow orifice in a dark chamber, Kepler saw in the image of the sun, caught on a paper screen, a minute flocculent speck, which he took for Mercury. It was a sun-spot.

himself, and so he gave him a professorship in Rostock instead, a position where he ran against the same old difficulty of work without salary.

In spite of all these distressing circumstances, Kepler was at least a fortunate man through his discoveries, and but few investigators can have tasted such hours of rapture as he. It was after the discovery of his third law, that he could write :

"But now nothing more holds me back ; a year and a half ago the first dawn, a few months ago the full day, a few days ago the pure sun of the most wonderful contemplation, have come upon me. Now I will revel in holy ecstasy ; now will I scoff at the children of men, with the simple avowal that I am stealing the golden vessels of the Egyptians, in order to build a tabernacle for my God, far distant from the land of Egypt. If they forgive, I shall be glad ; if they are angry, I shall bear it ; here I cast the die, and write a book to be read by my contemporaries or by posterity, it matters not ; it may wait for its reader thousands of years, since God himself waited six thousand years for him who should behold his work."

After this preface he unrolls in his favorite work, the *Harmonice mundi* (1619), a picture of the universe which would not cast discredit upon the greatest of poets. In the eyes of many the scheme, however, is discrediting to an astronomer, for it contains, besides many glorious thoughts and discoveries, fanciful speculations in regard to the earth-beast, its sleeping, waking, breathing, etc., as well as in regard to the spiritual relations of the heavenly bodies to one another. We may be allowed to quote a few more words from the epilogue, in order to show the beauty of the language.

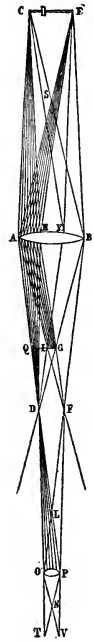
"From the music of heaven to its hearers," he cries, "from the muses to Apollo, the great chorister, from the six circling planets, that discourse the music to the sun which in the midst of their orbits revolves about itself alone, without change of place !"

From the complete harmony obtaining between the smallest and greatest movements of the planets, from their strong tendency toward the center, Kepler inferred not only that the sun influenced the planets, but that the latter also reacted upon the sun, which he mystically designates as the contemplation and interchange of their homage.

"What the nature of that seeing or that perception, in short, the nature of that soul in the sun, may be, it is difficult to guess ; it is, however, true that the assumption of the six principal orbits around the sun, which do homage to the latter with constant revolutions, and above all the further existence of harmony, the trace of the highest wisdom doing homage in the solar system, compels me to the assertion, that not only *from* the sun does light go out into all parts of the world, life and warmth as from the heart, motion as from the seat of power and might, but that also, *vice versa*, these tributes of the most delightful harmony gather from all

provinces of the universe. In short, in the sun are found counsel and favor for the whole kingdom of nature."

This continual outbreaking of poetical language gives to Kepler's works (of which we have received in modern times a model complete edition by Frisch¹) a living charm, and often lends to them a transporting power. He took occasion to speak in verse only in inspired moments, as in the lines given above from the *Mysterium cosmographicum*, and he then reaches such heights that he must be counted among the great "German classical authors," discovered by Daniel Strauss, "who wrote in Latin." Not seldom he was impelled to set forth his astronomical discoveries in the form of popular tales, of which we find several examples among his works, as for instance his story of Jupiter's satellites, of the star which had recently appeared in the Swan, and his "Dream of the World." Exceedingly vivid episodes are also frequently found in his other writings, as for instance in his work on the new star, which had appeared with great radiance in the foot of Serpentarius, in 1604. It was this appearance which raised again the question, whether the heavens could really be called unchangeable, according to Aristotle, when new stars actually appeared in it. Did this star originate recently from the light-exhalations of the universe, and if so, were perhaps all stars of the universe such incidental productions of fate? Against such assumptions, Kepler's deeply religious nature struggled, and the idea of Cicero came into his mind, that just as well might Homer's *Iliad* have been thrown together (as one would throw dice) from the twenty-four letters of the alphabet, as the harmony of the universe from a lot of whirling atoms.



KEPLER'S
ASTRONOMICAL
TELESCOPE.²

"Yesterday, in the midst of my meditations," he writes, "I was called to the table, as my young wife was serving a salad. 'Do you think,' I asked, 'that if pewter dishes, lettuce-leaves, grains of salt, drops of oil and vinegar, with hard-boiled eggs, had been flying about in this room higgledy-piggledy since creation, chance would ever have been able to gather them together to-day into a salad?' 'Certainly not into so well and skilfully mixed a one as this,' answered my beautiful wife."

¹ In eight volumes, Frankfort, 1858—1872.

² Construction given in the *Dioptrics* (1610). After Dannemann. For the convex and concave lenses of the Dutch and Galilean telescopes Kepler substituted two suitably disposed convex lenses, giving an inverted but clearer image.

When to the newly discovered telescope, which in the beginning was very imperfect and was constructed on the principle of the opera-glass, he had given the arrangement of the astronomical telescope still in use, he addressed the new instrument in the preface to his *Dioptrics* as follows: "O knowledge-fraught perspicil, more precious than any sceptre! Does not he who holds thee in his right hand, stand like a king and a master of the works of God?"

As often as I try to search out in the history of German investigation the prototype of the practical ideal of German philosophy, the ideal of Faust, who, wandering, but not confused, struggles forward to the solution of the great world-problems, I always come back again to Kepler, who, by his profound meditation, embodied as has none other, the specifically German bent of mind.

How proudly he asserts in his *Harmony of the World*, that he wrote this book as a German, according to the German manner and habit of philosophising, freely and without constraint. All his works and all his actions are in the most beautiful accord with this same reflective German spirit, which descends to the profoundest depths of speculation, yet ever remains self-conscious. He declined the call to Bologna because he was a German, and did not wish to renounce German liberty of speech and investigation; and although in constant distress in Prague, because of failure to receive his salary, he answered the invitation of the king of England, that only ingratitude could make him think of leaving Austria, his second fatherland. Without envy he recognised foreign merit, rejoiced over Galileo's discoveries, and admired in Copernicus still more than his learning, his "free spirit." Yet, if all who pass judgment on this German would do him like justice, they would have to say with Galileo: "While I hold Kepler in exceedingly high esteem on account of his fine unprejudiced mind, yet his manner of philosophising is radically different from my own."

THE NOTION OF A CONTINUUM.¹

BY PROF. ERNST MACH.

BY a continuum is understood a system or manifoldness of parts possessed in varying degree of a property A , such that between any two parts distant a finite length from each other, an infinite number of other parts may be interpolated, of which those that are immediately adjacent exhibit only infinitely small differences with respect to the property A .

There can be no objection to such a system, considered as a fiction merely, or as a purely arbitrary ideal construct. But the natural inquirer, who is not exclusively concerned with the purely mathematical point of view, is compelled to inquire whether there is anything in *nature* that corresponds to such a fiction. Space viewed in its simplest form as a succession of points in a straight line, time viewed as the succession of the elements of a uniformly sounding musical note, the succession of colors shown by the spectrum with the Fraunhofer lines obscured, are typical instances of the kind of continua presented in nature. If we consider such a "continuum" solely in the light of facts, it will be seen that there is nothing perceptible by the senses corresponding to an infinite number of parts or to infinitely minute differences. All we may say is, that in traversing such a succession, the differences between the parts increase as the parts move away from each other, until ultimately these differences admit of not the slightest doubt; and again, that as the parts approach each other the differences decrease, that afterwards it is alternately possible and impossible to distinguish them, according to chance and circumstances, and that finally it is altogether impossible to do so. *Points* of space and time do not exist for sense-perception; there exist for such, only spaces and times so small as not to admit of more minute division percep-

¹ Translated from the *Wärmelehre* by T. J. McCormack.

tible to the senses, or so small that we consciously neglect their size, although on increased attention they might admit of resolution into component elements. The possibility of passing imperceptibly and uninterruptedly from a property A to a property A' , sharply distinguishable from A , is the important point. The fact is, that any two terms on given trial are either distinguishable or undistinguishable.

It is possible to remove a large number of parts from a given sensory continuum without causing the system to cease giving the impression of a continuum. If we imagine a large number of narrow equidistant bands of color cut out of a spectrum, and the remainder pushed together until the parts touch, the spectrum will still give the impression of a color-continuum, in spite of the interruption of continuity in the wave-lengths of the lines. In like manner, an ascending musical note, if the intervals between the rates of vibration be sufficiently small, may be regarded as a continuum, and the jolting movement produced by a sufficiently large number of successive but detached stroboscopic pictures may also be made to appear as a continuous movement.

If the parts of a sensory continuum stood forth as individual entities and were distinguishable with absolute accuracy, the employment of artificial expedients, as the use of measures for comparing continua of the same kind and the use of dividing lines for rendering imperceptible differences of space distinct by means of conspicuous differences in color, etc., would be superfluous. But the moment we introduce such artifices as being superior physically for the indication of the differences, we abandon the domain of immediate sense-perception, and pursue a course in every respect similar to that of substituting the thermometer for the sensation of heat. A distance in which the measure is contained twice or three times, is then twice or three times that in which it is contained once; and the hundredth part of the measure corresponds to a hundredth part of the difference, although it may not be said that this difference holds good for direct perception. With the introduction of the measure, a new definition of distance or difference has been introduced. Judgments of difference are now no longer formed from simple sense-perception, but are reached by the more complex reaction involved in the application of the measure; and the result depends upon the issue of the experimental test. The consideration last adduced may be profitably called to the attention of that still large body of thinkers who refuse to admit that the

axioms of geometry are the results of experience,—results *not* given by direct perception when *metrical* concepts are introduced.

The employment of measures suggests the employment of numbers, but the use of the latter is not necessarily entailed until it is resolved to employ only one measure, which is multiplied or subdivided according as the necessity arises for a larger or smaller continuum of comparison. In using a measure divided into absolutely equal parts, we are immediately enabled to employ all the numeral experiences which we have gained from our study of discrete objects. This is not the place for a detailed discussion of the manner in which operations of counting themselves gave rise to the necessity of new numeral concepts far transcending the bounds of the original system of integer positive numbers and of the gradual manner in which negative and fractional numbers, and finally the entire system of rational numbers, came into being.

If a unit is to be divided, it must either exhibit natural parts for such a division, as for example do many fruits, or it must at least permit of being conceived as made up of perfectly homogeneous equivalent parts. The early appearance of unit-fractions is a probable indication that division was learned by experiences of the first-mentioned kind, and that the skill acquired in that field was carried over to cases of the second class, namely, to the division of continua. It is here apparent from the simplest instances that the number-system which originated from the consideration of discrete objects is inadequate for the representation of fluent or continuous states. For instance, the common fraction $\frac{1}{3} = 0.333333\dots$. A point of trisection, in other words, can never be found exactly by decimal subdivision, however minute. The ratios of certain line-segments, as that of the diagonal to the side of the square, are absolutely unrepresentable by rational numbers, as Pythagoras long ago discovered,¹ and lead immediately to the concept of the irrational.²

The cases of this are innumerable. It may be expressed by saying that “the straight line is infinitely richer in point-individuals than the domain of rational members is in number-individuals.”³ But the remark is applicable, as the illustration given above of the

¹ Euclid's ingenious proof of this proposition is found in his *Elements*, X, 117. Compare Cantor's views in his *Geschichte der Mathematik*, pp. 154, et seq.

² The irrational number $\sqrt{\beta}$ is the limit between all rational numbers (1) the squares of which are less and (2) the squares of which are greater than β . In the first class no greatest, and in the second no least, number can be assigned. If $\sqrt{\beta}$ is rational, the number in question is the greatest of the first and the least of the second class. Compare Tannery, *Théorie des Fonctions*, Paris, 1886

³ Dedekind, *Stetigkeit und irrationale Zahlen*, Brunswick, 1892.

point of trisection shows, quite irrespective of the irrational feature, to every *special* number-system. We might say $\frac{1}{3}$ is a relative irrational number, as compared with the decimal system.

Numbers, which were originally created for the intellectual mastery of discrete objects, accordingly prove themselves to be absolutely inadequate for the mastery of continua which are conceived as inexhaustible, be these real or fictitious. Zeno's assertion of the impossibility of motion on account of the infinite number of the points that had to be traversed between the initial and terminal stations, was admirably refuted in this sense by Aristotle, who remarked that "a moving object does not move by numbers."¹ The idea that we are obliged to exhaust all things by counting is due to the inappropriate employment of a method which, for a great many cases, is quite appropriate. A pathological phenomenon of what might be called the counting-mania actually makes its appearance here. No one will be inclined to discover a problem in the fact that the series of natural numbers can be continued upwards as far as we please, and consequently can never be completed; and it is not a whit more necessary to discover a problem in the fact that the division of a number into smaller and smaller parts can be continued *ad libitum* and consequently never completed.

At the time of the founding of the infinitesimal calculus, and even in the subsequent period, people were much occupied with paradoxes of this character. A difficulty was found in the fact that the expression for a differential was never exact, save when the differential had become infinitely small,—a limit which could never be reached. The sum of non-infinitely small elements, it was thus thought, could give only an approximately correct result. It was sought to resolve this difficulty in all sorts of ways. But the actual practical uses to which the infinitesimal calculus is put are totally different from what is here assumed, as the simplest example will show, and are affected in no wise whatever by the imaginary difficulty in question.

If $y=x^m$, I find for an increment dx of x the increment

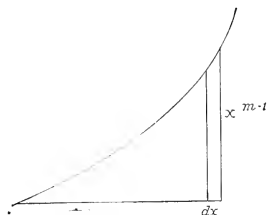
$$dy = mx^{m-1} dx + \frac{m(m-1)}{1 \cdot 2} x^{m-2} dx^2 \\ + \frac{m(m-1)(m-2)}{1 \cdot 2 \cdot 3} x^{m-3} dx^3 + \dots$$

Having this result, it will be seen that the function x^m reacts in a definite manner in response to a definite operation, namely, that of

¹ Hankel, *Geschichte der Mathematik*, Leipsic, 1874, p. 149.

differentiation. This reaction is a characteristic mark of x^m , and stands on precisely the same footing as the bluish-green coloring which arises from dissolving copper in sulphuric acid. The number of terms that remain standing in the series is in itself indifferent. But the reaction is simplified by taking dx so small that the subsequent terms vanish with respect to the first. It is on account of this simplification only that dx is considered very small.

In a curve with the ordinate $z = mx^{m-1}$, it is seen that on increasing x by dx , the quadrature of the curve is increased by a small amount of surface, the expression for which when dx is very small



is simplified by reduction to the form $mx^{m-1}dx$. In response to the same operation as before, and under the same simplifying circumstances, the quadrature reacts as the familiar function x^m reacts. We recognise the function, thus, by its reaction.

If the mode in which the quadrature reacted did not accord with the mode of reaction of any function known to us, the entire method would leave us in the lurch. We should then have to resort to mechanical quadratures; we should actually be compelled to put up with finite elements; we should have to sum up finite numbers of these elements; and in such an event the result would be really inexact.

The twofold *salto mortale* from the finite to the infinitely small, and back again from this to the finite, is accordingly nowhere actually performed; on the contrary, the situation here is quite similar to that in every other domain of research. Acquaintance with mathematical and geometrical facts is acquired by actual employment with those facts. These, on making their appearance again, are recognised, and when they appear in part only, they are completed in thought, in so far as they are uniquely determined.¹

The manner in which the conception of a continuum has arisen

¹ It is well known that differentials may be avoided by operating with differential coefficients which are the limiting values of the difference-quotients. Timid minds which find solace in this mode of conception will be content to put up with the cumbrousness sometimes involved.

will now be clear. In a sensory system the parts of which exhibit fluxional characteristics not readily admitting of distinction, we cannot retain the single parts either in the senses or in the imagination with any certainty. To be able to recognise definitely, therefore, the relations obtaining between the parts of such systems, we have to employ artificial devices such as measures. The mode of action of the measures is then substituted for the mode of action of the senses. Immediate contact with the system is lost by this procedure; and, furthermore, since the technology of measurement is founded on the technology of counting, numbers are substituted for the measures precisely as the measures were substituted for direct sense-perception. After we have once performed the operation of dividing a unit into component parts, and after we have once noticed that the parts exhibit the same properties as the original unit, then no obstacle presents itself to our continuing in thought to infinity the subdivision of the number which stands for the measure. But in doing so we imagine that we have also divided both the measure and system that is measured, into infinity. And this leads us to the notion of a continuum having the properties which we specified at the beginning of this article.

But it is not permissible to assume that everything that can be done with a sign or a number can also be done with the thing designated by that sign or number. Admitting that the number which is employed to specify a distance can be divided into infinity without any possibility whatever of meeting with obstacles, still the possibility of such division by no means necessarily applies to the distance itself. There is nothing that presents the *appearance* of a continuum but may still be composed of discrete elements, provided only those elements be sufficiently small as compared with our smallest practically applicable measures, or provided only they be sufficiently numerous.

Wherever we imagine we discover a continuum, all we can say is, that we can institute the same observations with respect to the smallest observable parts of the system in question as we can in the case of larger systems, and that we observe that the behavior of those parts is quite similar to that of the parts of larger systems. The length to which these observations may be carried can be decided by experience only. Where experience raises no protest, we may hold fast to the notion of a continuum, which is in no wise injurious and represents a convenient fiction only.

THE SO-CALLED MYSTERY PLAYS.

BY E. F. L. GAUSS.

THE return during the coming summer of the Passion-Play at Oberammergau in Bavaria has revived and increased the interest in this most famous of all mystery-plays, perhaps more so in this country than elsewhere. It may be timely, therefore, to inquire into the history and nature of these plays, with special reference to the one above named, which dates in its present form from the year 1633, and has since then been repeated every ten years, save when adverse circumstances prevented its performance.

While religious plays of a similar nature existed before the Christian era, and some are known of more modern people other than Christians, it may be said that the Christian mystery-plays are as old as the story of Christ. From the beginning of the Christian services, there was more or less of a dramatic element in them, which has developed with the Church. This is due to the instinct in man to express his religious sentiments and feelings by act as well as by word, and is more or less shared by all religious services. Indeed, every art of man has grown out of this human impulse and need. Architecture, as an art, began with the erection of temples to the gods, giving painting and sculpture the necessary foundation and the opportunity for development. If it were not innate in these arts to give expression to the spiritually highest conception, there would not be the revolt against the realistic tendencies of our present time.

The pure dramatic art especially, representing the highest ideal types, not in colors and dead materials as sculpture and painting, but by imitation through living figures, has sprung from the unavoidable acting in religious services. We need only point to the worship of Dionysos by the Greeks, which consisted chiefly in mimic representations of the exploits of the god.

But as the religious conceptions grew from the crude to higher ideals, culminating in the dynamic God-idea of the Christian faith, so grew the ideals of dramatic representation upon the religious field. Whoever is familiar with the services and ceremonies of the Roman and Greek Catholic Church, must have been struck by the dramatic force in them. But especially on certain holidays of the Church, such as Christmas, the Feast of the Wise Men from the East, Palm Sunday, Good Friday, the day of Christ's burial, and



1. SATAN, ATTIRED AS A BISHOP, SLAYS THE PREACHER ZACHARIJAH WITH THE ASSISTANCE OF THE COOK.



3. THE SON IS SLAIN.



2. SATAN APPEARS IN DISGUISE AT THE VINTAGE.



4. SATAN ANNOUNCES THE DEATH OF THE SON AT THE MOUTH OF HELL.

SCENES FROM M. JACOB RUFF'S RELIGIOUS DRAMATISATION OF THE STORY OF JOB AND THE PARABLE OF THE VINEYARD.

Satan is introduced as sowing the seeds of sedition in the minds of the servants of the vineyard and induces them to slay the son of their master.¹

Easter Sunday, the services have unfolded from an early date into actual dramatic plays. Particularly striking among these in some

¹ Performed at Zurich, 1539 A. D., on May 26. From K nnেকে, after contemporaneous illustrations.

countries are the representations of Christ's entrance into Jerusalem on Palm Sunday and of his resurrection on Easter Day. In the latter, priests dressed as women approach the tomb, and upon hearing the assurance of the angel seated there, "He is not here, he is risen!" return to the altar, announcing to the assembled congregation: "Christ is risen!" The great processions of the Catholic Church are to this day dramatic representations of features in the life of Christ or in the history of the Church.

The mystery-plays in all countries were largely of the same character, since they have the same foundation and the same origin, the coloring only varying in small measure with the characteristics and peculiar religious conceptions of the people. They reached their climax in the latter half of the middle ages, when the perform-



GOD THE FATHER



SATAN



GOD THE SON

THE MAIN ACTORS IN THE MEDIÆVAL MYSTERY-PLAYS.

ance of the larger plays lasted several days. Their texts, taken from the Gospels and the legends of the Church, were mostly crude and, while generally written in the language of the country, profusely interspersed with Latin words and phrases. As a rule their authors were clerics, in most cases monks or nuns. But while the poetic value of the mystery-plays was but small, we may assume that they were all most excellently presented as to acting and scenic effect.

It is a remarkable fact, that the great solemnity of these plays did not protect them against the intrusion of jokes and comic intermezzos, for which an opportunity was offered in the part played by the devil, the deeds of Judas, and the bitterness of the Jews. The latter especially fared ill in these plays, and it may be supposed

¹ From *Bilderatlas zur Geschichte der deutschen Nationallitteratur*, by Dr. Gustav Könnecke, Marburg, 1895, p. 93.

that their portraiture in them had not a little to do with the contempt in which the Jews were held in the middle ages.

The oldest of the passion-plays known is that of St. Gall, Switzerland, which came down to us from the fourteenth century. In England the mystery-plays were generally only performed in connexion with the processions on Corpus Christi day. In Austria, the Tyrol, and Germany, they were prevalent up to the eighteenth century, while in France a special community, the "Confrérie de la Passion," was founded for the purpose of producing and enacting passion-plays. From the north of France we have only mystery-plays of the fifteenth century, but these in large numbers. It is worthy of notice that while Italy is the centre of the Catholic Church, where its ceremonies are matters of daily observance and therefore most familiar to the people, we know of only one Italian passion-play, and that was published as late as 1888 at Turin.

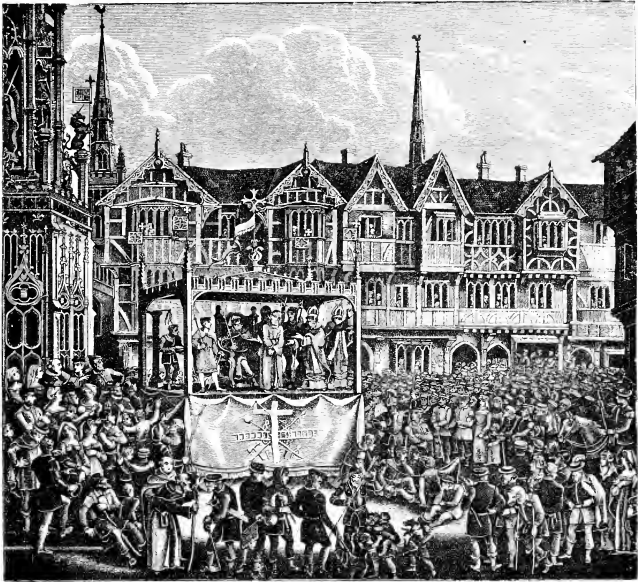
The performance of the mystery-plays was, as indicated before, originally part of the church-services and very simple. The performers were, as a rule, either priests or members of sacred orders, monks or nuns. The latter were at one time very prominent in them, because the Virgin and Mary Magdalene were necessarily represented.

One of the simplest among the early plays consisted in "The Lamentations of Mary" at the death of her son, forming the lyric introduction to the celebration of Easter. Soon, however, the mystery-plays became in a measure worldly, inasmuch as they were played by worldly companies in public places, generally at fairs and marts. In fact, the name of these latter in some modern languages, particularly in German, is derived from "missa" or "mass," because they ordinarily took place in connexion with the observance of the more important church feasts.

On such occasions the mystery-plays were performed upon special stages, roughly erected in the market-places, or even more commonly in the street between the houses, extending from one side to the other. These stages ordinarily consisted of three divisions, *heaven*, *earth* and *hell*, which could be opened to rear and front, or on large places to all four sides, so that the performance could be witnessed by all the people gathered around the stage.

One of the most characteristic mystery-plays of the middle ages was that of the "Wise and Foolish Virgins," which was very popular for several centuries, especially in Germany. At the beginning of this play Christ (the "*dominica persona*," as he was called in most of the mystery-plays) appears in the uppermost part of the

stage (heaven), surrounded by Mary and the angels. Then the virgins come upon the scene in the middle part of the stage (earth). The story is played as it is related in Matthew with some additions, showing Mary interceding for the foolish virgins. Thereupon the lower part of the stage (the jaws of hell) hitherto closed, opens. Lucifer and a host of devils and of the damned are seen. They remind Christ that he had promised to be a just judge and claim



OLD ENGLISH MYSTERY PLAY.

As performed on a portable stage erected in a public market-place, usually on the occasion of some church festival.

the foolish virgins, who, after repeated vain intercessions from Mary, are delivered up to the Prince of Darkness, and are bound by the devils with chains, and dragged below. They disappear with the cry of despair, "We deserve the wrath of God, we are eternally lost!" while above, Christ, Mary, the angels, and the wise virgins are seen in blissful union. Thus ends the most dramatic of all mystery-plays of old. How powerful the effect of these plays was

upon the spectators, is shown by the case of Frederic, Landgrave of Thuringia, who, upon witnessing one of the performances of this play just described, fell into an hysterical state, which deprived him of his reason and caused his death three years after.

Aside from some minor performances connected with the services of the Catholic Church, nothing is left in our days of the old mystery-plays, except the great Passion-Play at Oberammergau, and in minor form in some other German and Swiss villages, refined and purified in conception as well as in its dramatic production. The town of Oberammergau itself is of historic interest. The Romans used the place as a trading-post and called it *Coveliaca*. It has always been a thrifty village latterly, especially in certain industries connected with the religious life of the Catholic people. It is not known whether mystery-plays were performed in the town in the middle ages or previously, but there are strong indications that such was the case.

However this may be, the fact is authenticated that in 1633 the present Passion-Play was first produced there. It came about in this wise: In the year named the plague visited that neighborhood and claimed a great many victims in the village. The inhabitants in their simple faith trusted that God would send them succor, and they made a vow to perform "the great atoning-sacrifice upon Calvary to the glory of God." The vow was enthusiastically participated in by all the people of the town and piously carried out. Miraculously—as the people looked upon it—the plague ceased, and in their gratitude to their deliverer and in their desire to perpetuate their thanks through their children, the godly peasants resolved to repeat the performance every ten years, the present year closing the twenty-sixth decade.

Originally the performances took place in the most primitive way at the cemetery of the village, but the play gradually attracted large numbers of people, who now flock to witness it from all parts of the globe, so that it soon became necessary to erect a play-house in the village and to repeat the play a number of times during the season. But not until 1890 was there anything but a board-fence surrounding the seats of the auditorium, beside the spacious stage, all uncovered. This year there is a large and commodious building, costing 62,000 dollars, with a seating capacity of from 4-5000, still partly without a roof, as is also the greater portion of the stage. The auditorium, fitted out with folding-chairs, is so well arranged that every foot of the stage is clearly in view from even the cheapest seat, and the acoustic properties of the hall are most perfect.

The stage is immense, representing chiefly the streets and buildings of Jerusalem at the time of Christ. Decorative paintings show the original "play-ground" upon the cemetery, the old commercial roads of the Germans and biblical scenes. Everything is most artistic.

The text of the Passion-Play was originally of the same crudeness that marked the early mystery-plays, and is claimed to have been written by one of the monks of the neighboring monastery of Ettal. In the course of time, however, the words were repeatedly improved, until the drama reached a high perfection in its present form, which was given it in 1850 by the priest of the village, Daisenberger. This pious man was for many years the spiritual guide of the villagers, and to his wise and energetic efforts and zeal is due the great interest of the entire world in the Passion-Play, which never fails to make a deep impression upon every spectator of whatever creed and views he may be. The performers are all people of the village, and those impersonating the more important characters generally play them a number of seasons, achieving thereby international reputation.

The present year will bring an almost complete change in the cast, and much is expected, especially of the two persons who bear the rôles of Christ and Mary. There is much music in the play, and the choruses are pronounced by experts exceptionally fine.

Oberammergau is very picturesquely situated between high mountains about 2550 feet above sea-level, and the highest of the mountains overlooking the village, the Kofel, is fittingly crowned by an immense stone-group of the Crucifixion, towering above the summit more than forty feet. This fine piece of sculpture was erected in 1875 by the admiring friend of the villagers, King Louis II. of Bavaria.

THE OLD AND THE NEW MAGIC.

BY THE EDITOR.

[CONCLUDED.]

AFTER the old magic had retreated to the dingy haunts of fortune-tellers and to the equivocal atmosphere of spiritualistic séances, leading the lingering life of a consumptive, modern magic developed rapidly and is now becoming more and more fascinating.

In speaking of modern magic, we refer to the art of the prestidigitator, and exclude from its domain the experiments of hypnotism as well as the vulgar lies of fraud. There is no magic in the psychosis of an hysterical subject who at the hypnotiser's suggestion becomes the prey of hallucinations; nor is there any art in the deceptions of the fortune-teller, whose business will vanish when the public ceases to be credulous and superstitious. The former is a disease, the latter mere fraud. Magic proper (i. e., the artifices of prestidigitation) is produced by a combination of three factors: (1) legerdemain proper, or sleight of hand; (2) psychological illusions, and (3) surprising feats of natural science with clever concealment of their true causes. The success of almost every trick depends upon the introduction of these three factors.

The throwing of cards is mere dexterity; Zöllner's famous figures of parallel lines having an apparent inclination toward one another is a pure sense-illusion (see the cut on page 426); so is the magical swing; while fire-eating (or better, fire-breathing) is a purely physical experiment. But it goes without saying that there is scarcely any performance of genuine prestidigitation which is not a combination of all these elements.

The production of a bowl of water with living fishes in it is a combination of dexterity with psychology. The bowl, covered with an India rubber membrane, hangs in a running sling fastened to a cord, at the back of the performer, who exhibits to the audience a napkin, and while showing them that it contains nothing by

spreading it out before their eyes, he bows slightly and slips the bowl into the napkin. Seizing the bowl and taking off the India rubber membrane together with the napkin is the work of a moment; and yet it is nothing but dexterity, so tempered with deception that the audience (unless initiated into the trick) cannot discover the cause of the bowl's appearance.

When a performer makes a dollar disappear by holding it up in his left hand and catching it with his right, we have a psychical illusion. The movement of the right hand merely diverts the attention, for the dollar remains in the left hand and is hidden, while the right hand in which every spectator expects it to be, is slowly opened and shown to be empty.

The trick with the glass dial (which is now exhibited by both Mr. Kellar and Mr. Hermann, the nephew of the late Alexander Hermann) is purely physical. The machinery used by them is apparently different, though Mr. Kellar's apparatus is the more perfect; for in neither case is any sleight of hand needed nor any psychological diversion, except in letting the accomplice behind the stage know the number to which he should point.

As an instance of a wonderful trick which is a mere sense-illusion we mention the magic swing, which is explained by Albert A. Hopkins in his comprehensive book on magic¹ as follows:

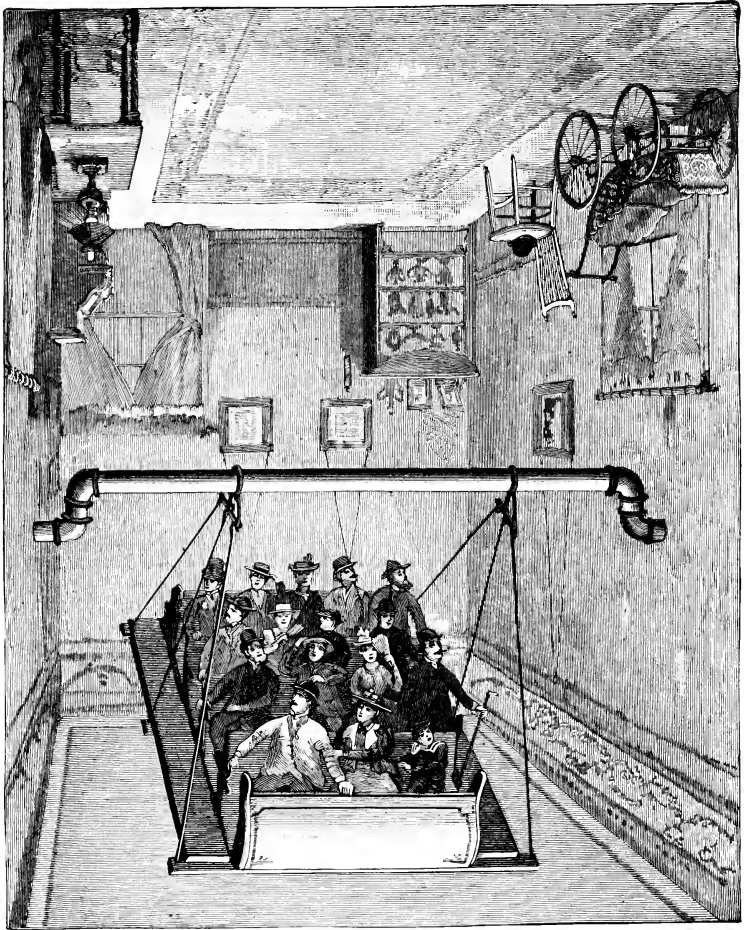
"Those who are to participate in the apparent gyrations of the swing—and there may be quite a number who enjoy it simultaneously—are ushered into a small room. From a bar crossing the room, near the ceiling, hangs a large swing, which is provided with seats for a number of people. After the people have taken their places, the attendant pushes the car and it starts into oscillation like any other swing. The room door is closed. Gradually those in it feel after three or four movements that their swing is going rather high, but this is not all. The apparent amplitude of the oscillations increases more and more, until presently the whole swing seems to whirl completely over, describing a full circle about the bar on which it hangs. To make the thing more utterly mysterious, the bar is bent crank fashion, the swing continues apparently to go round and round this way, imparting a most weird sensation to the occupants, until its movements begin gradually to cease and the complete rotation is succeeded by the usual back and forth swinging. The door of the room is opened, and the swinging party leave. Those who have tried it say the sensation is most peculiar."²

"The illusion is based on the movements of the room proper. During the

¹*Magic, Stage Illusions, and Scientific Diversions, Including Trick Photography.* Compiled and edited by Albert A. Hopkins. With 400 illustrations. New York: Munn & Co. 1898. Price, \$2.50. We noticed this book in the January number of *The Open Court*, but are glad to call our readers' attention to it again, as it will be a welcome addition to the library of those who enjoy the séances of our prestidigitators and would like to possess a work of ready reference on the subject.

²See the illustrations on pages 424 and 425. The illustration on page 424 shows the true position of the swing, that on page 425 shows the illusion produced by a riddle in the swing.

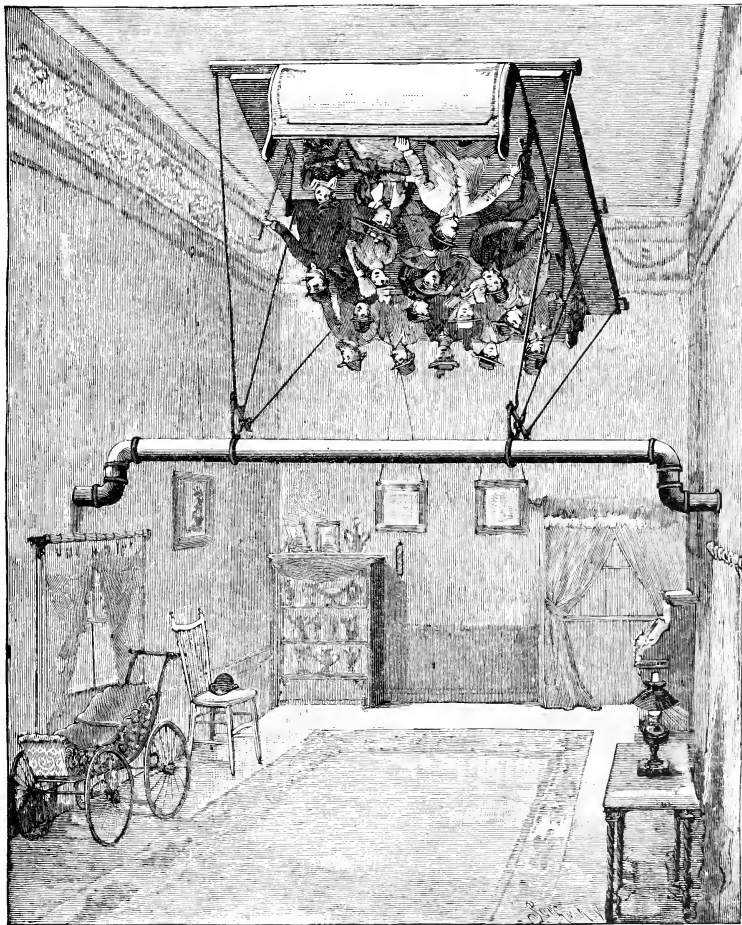
entire exhibition the swing is practically stationery, while the room rotates about the suspending bar. At the beginning of operations the swing may be given a slight



TRUE POSITION OF THE SWING.

push; the operators outside the room then begin to swing the room itself, which is really a large box journaled on the swing bar, starting it off to correspond with the

movements of the swing. They swing it back and forth, increasing the arc through which it moves until it goes so far as to make a complete rotation. The operatives

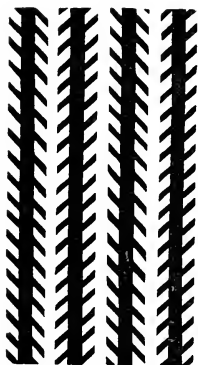


ILLUSION PRODUCED BY A RIDE IN THE SWING.

do this without special machinery, taking hold of the sides and corners of the box or "room." At this time the people in the swing imagine that the room is stationary

while they are whirling through space. After keeping this up for some time, the movement is brought gradually to a stop, a sufficient number of back and forth swings being given at the *finale* to carry out the illusion to the end.

"The room is as completely furnished as possible, everything being, of course, fastened in place. What is apparently a kerosene lamp stands on a table, near at hand. It is securely fastened to the table, which in its turn is fastened to the floor, and the light is supplied by a small incandescent lamp within the chimney, but concealed by the shade. The visitor never imagines that it is an electric lamp, and naturally thinks that it would be impossible for a kerosene lamp to be inverted without disaster, so that this adds to the deception materially. The same is to be said of the pictures hanging on the wall, of the cupboard full of chinaware, of the chair with a hat on it, and of the baby carriage. All contribute to the mystification. Even though one is informed of the secret before entering the swing, the deception is said to be so complete that passengers involuntarily seize the arms of the seats to avoid being precipitated below."



ZÖLLNER'S ILLUSION.

The illusion is purely an instance of misguided judgment, which is commonly but erroneously called illusion of the senses¹ and belongs to the same category as the well-known Zöllner figures mentioned above and consisting of heavy lines crossed slantingly by lighter lines. The heavy lines are parallel but appear to diverge in the direction of the slant. (See cut.)

To conjure ghosts has always been the highest ambition of performers of magical tricks and we know that the magic lantern has been used for this purpose since mediæval days. Benvenuto Cellini chronicles a strange story in his fascinating biography, which we recapitulate in Mr. Hopkins's words:

"Cellini, as guileless as a child in matters of science, desiring to study sorcery, applied to a Sicilian priest who was a professed dabbler in the occult art. One dark night they repaired to the ruins of the Coliseum at Rome; the monk described a circle on the ground and placed himself and the great goldsmith within its mystic outlines; a fire was built, intoxicating perfumes cast on it, and soon an impenetrable smoke arose. The man of the cowl then waved his wand in the air, pronounced sundry cabalistic words, and legions of demons were seen dancing in the air, to the great terror of Cellini. The story of this spirit séance reads like an Arabian tale, but it is easily explainable. The priest had a brother confederate concealed among the ruins, who manipulated a concave mirror, by means of which painted images were thrown on the smoke."

¹For an explanation of similar cases of misguided judgment see *The Monist*, Vol. III., p. 152.

The same author describes the further perfection of the art of conjuring ghosts by Robertson and then by Mr. Pepper, as follows :

"In the height of the French Revolution, when the guillotine reeked with blood and the ghastly knitting-women sat round it counting the heads as they fell into the basket, a Belgian optician, named Etienne Gaspard Robertson, arrived in Paris, and opened a wonderful exhibition in an abandoned chapel belonging to the Capuchin convent. The curiosity-seekers who attended these séances were conducted by ushers down dark flights of stairs to the vaults of the chapel and seated in a gloomy crypt shrouded with black draperies and pictured with the emblems of mortality. An antique lamp, suspended from the ceiling, emitted a flame of spectral blue. When all was ready a rain and wind storm, with thunder accompanying, began. Robertson extinguished the lamp and threw various essences on a brazier of burning coals in the center of the room, whereupon clouds of odoriferous incense filled the apartment. Suddenly, with the solemn sound of a far-off organ, phantoms of the great arose at the incantations of the magician. Shades of Voltaire, Rousseau, Marat, and Lavoisier appeared in rapid succession. Robertson, at the end of the entertainment, generally concluded by saying : 'I have shown you, citizens, every species of phantom, and there is but one more truly terrible specter—the fate which is reserved for us all.' In a moment a grinning skeleton stood in the center of the hall waving a scythe. All these wonders were perpetrated through the medium of a phantasmagoric lantern, which threw images upon smoke."

The art of conjuring ghosts was perfected when the introduction of large show windows called Professor Pepper's attention to the usefulness of glass as affording a transparent mirror. Mr. Hopkins says :

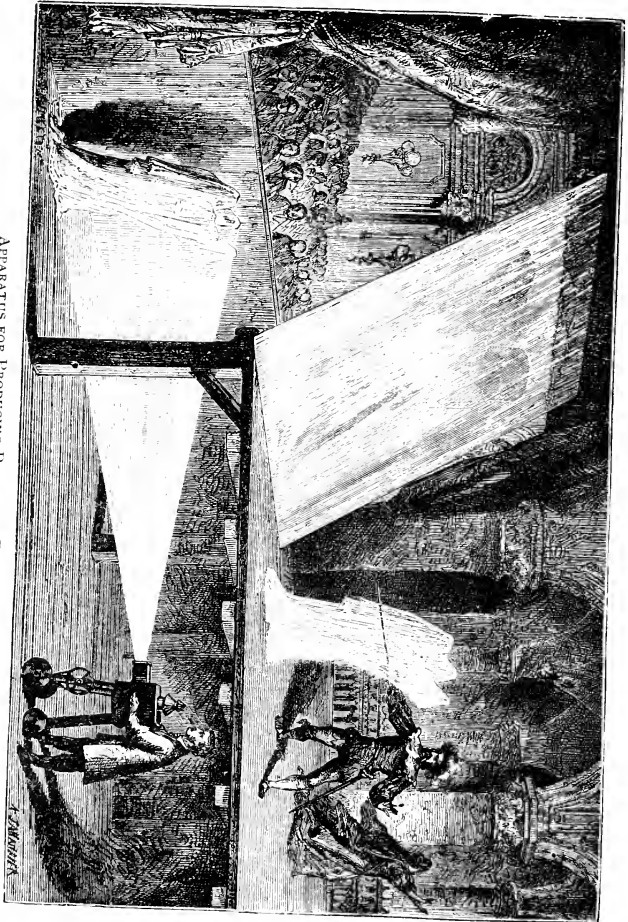
"Clever as was Robertson's ghost illusion, performed by the aid of the phantasmagoric lantern, it had one great defect : the images were painted on glass and lacked the necessary vitality. It was reserved for the nineteenth century to produce the greatest of spectral exhibitions, that of Professor Pepper, manager of the London Polytechnic Institution. In the year 1863, he invented a clever device for projecting the images of living persons in the air. The illusion is based on a simple optical effect. In the evening carry a lighted candle to the window and you will see reflected in the pane, not only the image of the candle but that of your hand and face as well. The same illusion may be seen while travelling in a lighted railway carriage at night ; you gaze through the clear sheet of glass of the coach window and behold your "double" travelling along with you. The apparatus for producing the Pepper ghost has been used in dramatisations of Bulwer's "Strange Story," Dickens' "Haunted Man" and "Christmas Carol," and Dumas' "Corsican Brothers." In France the conjurers Robin and Lassaigne presented the illusion with many novel and startling effects."

The illustration on page 428, reproduced from Carl Willmann's work, sufficiently explains all details.

The Indian basket trick is a shocking performance, still practised in Hindustan in the open streets. A child is placed in an oblong osier basket strapped so tight that it cannot escape, then a sword is thrust into the basket, which on being withdrawn drips

with blood. The audience is terror-stricken, but when the basket is opened it is found empty.

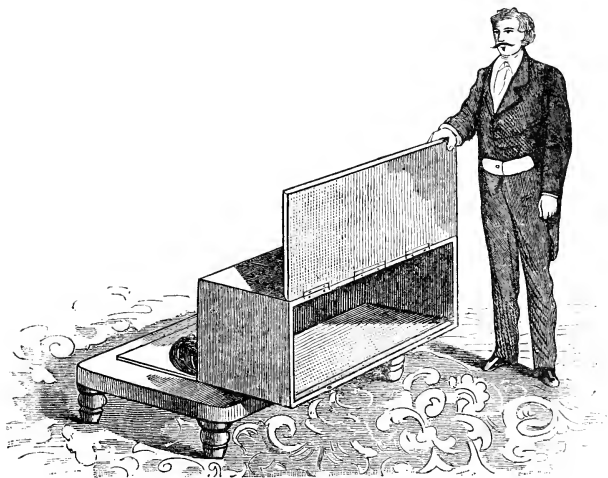
APPARATUS FOR PRODUCING PROFESSOR PEPPER'S GHOST.



The explanation is simple. The performer has several assistants of similar appearance around him, all of them dressed nearly

alike. The child crawls out through an unnoticeable slit where two ends overlap; and while the conjurer puts his knee against the basket, apparently to fasten the strap as tightly as possible, the prisoner hides under his flowing robe and then joins the other assistants.

Herr Willmann describes practically the same trick under the title "Spirit box," designed to prove the permeability of matter. A medium is placed in the box, and after some hocus-pocus the manager reopens it and declares it to be empty; for the purpose of proving his assertion he turns it over toward the public, and when



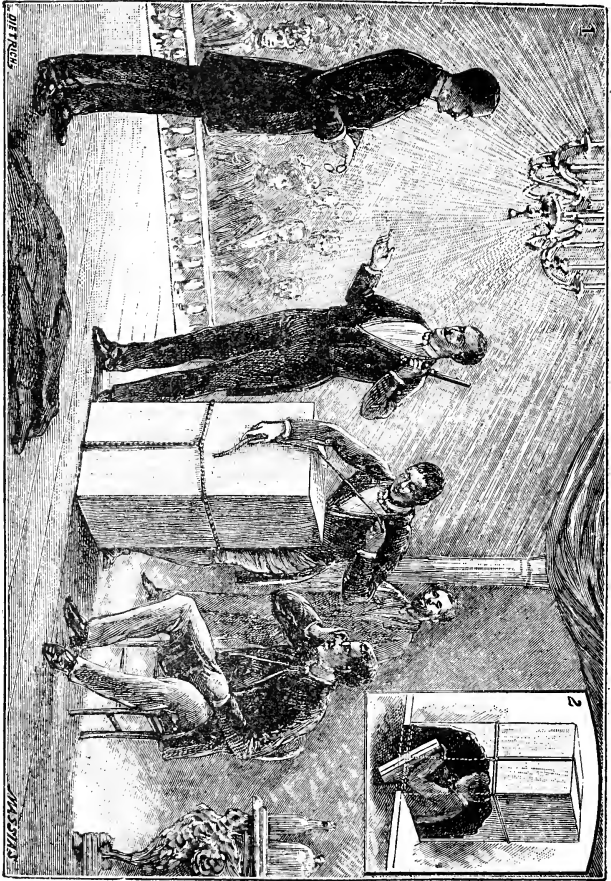
THE "SPIRIT-BOX," OR MYSTERIOUS TRUNK.

the lid is opened, the medium, who remains all the while in his place, has become invisible, because he is hidden by the interior part of the double wall, which now seems to be the bottom of the box. The box stands upon a podium, in order to show that the medium could not have escaped through the floor. The adjoined illustration reveals the secret of the trick, the explanation of which is as simple as the effect is surprising.

On stages which allow the prestidigitator to use traps, a trunk is placed so as to allow the prisoner to escape through the floor. The movable wall of the trunk in such a case swings round an axis

which lies parallel with the rope that is afterwards fastened round the trunk. The movable wall in the trunk connects with a trap in the floor, and while visitors from the audience closely watch the

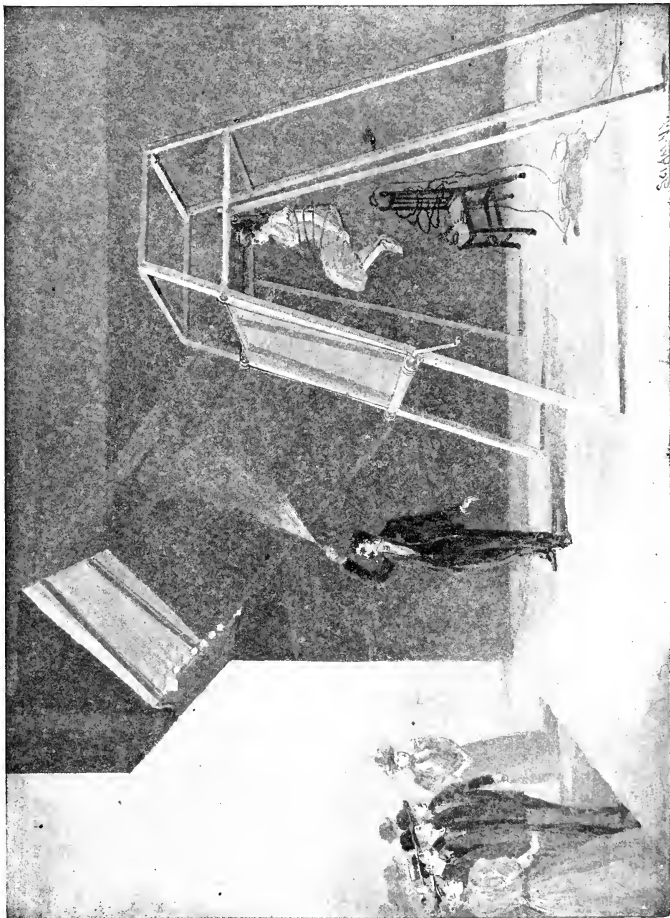
THE MYSTERIOUS TRUNK OPERATED THROUGH A TRAP IN THE STAGE.



fastening, the enclosed person makes his escape with the greatest ease.

Kellar has still another method of making a person disappear,

which being done in full view of the audience is extremely perplexing. The trick was invented by Mr. W. E. Robinson, the assistant



of the late Hermann and is based upon the same device as Professor Pepper's ghosts. Mr. Hopkins describes it as follows (see the above illustration):

"When the curtain is raised the square frame is seen; this frame is braced laterally by side pieces. At the lower part of the frame, within easy reach of the prestidigitator, is a windlass. Ropes pass from this windlass, over pulleys, to a crossbar in the upper part of the frame. A lady is now brought upon the stage and seated in a chair, which she grasps tightly. She is then tied tightly to the chair with ropes, and her hands are chained together. The prestidigitator now secures the chair, with its fair occupant, to the ropes which are connected with the windlass, by means of hooks which fasten to the top frame of the chair. The professor of magic now winds away at the windlass and raises the chair until the head of the victim is on a level with the crossbar. He then discharges a pistol, and at the same instant the lady disappears and the chair drops to the floor. Such is, in brief, the mode of operation of the trick called 'Gone.'"

The explanation is simple. The frame is covered between the cross bars with plate-glass which is invisible and leaves the lady on the chair in full sight so long as the light falls upon her. A screen of the same color as the background is concealed above the curtain and placed at such an angle as to allow its reflexion to pass out to the audience. The prestidigitator fires several shots from a pistol, which is a signal for his assistant to turn a switch. The lady is now veiled in relative darkness while the screen is illuminated and its reflexion on the plate-glass conceals her from sight. She drops the chair, which, like the shots, helps to divert the attention of the audience, and the curtain drops before further investigation can be made. The illusion is perfect, and the more watchful the public are, the more will they wonder how a person can disappear so completely and suddenly before their eyes.

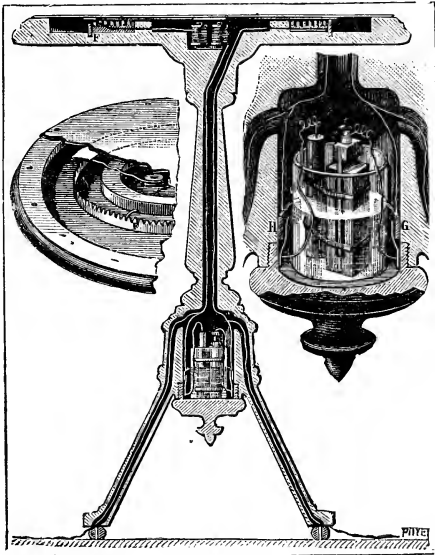
Tricks performed by mediums are in one respect quite different from the feats of prestidigitators; if they come up to the standard, they are, or ought to be, based upon the psychic dispositions of people, setting, as it were, traps for them and allowing them to be caught in their own superstitions. Believers will do it willingly and be grateful for the deception, while determined unbelievers are either altogether hopeless or will be so puzzled as to be likely to become believers. But sleight of hand is always a valuable aid to the medium; and, as tricks pure and simple, mediumistic séances are not different from the performances of prestidigitators; they differ only in this, that they claim to be done with the assistance of spirits. Mediums must be on the lookout and use different methods as the occasion may require. They produce rappings with their hands, or their feet,¹ or with a mechanism hidden in their shoes;

¹One of the Fox Sisters could produce rappings through a peculiar construction of the bones of her foot, and Cumberland's big toe was blessed with a tendon of its own, enabling him to rap the floor quite vigorously without being detected.

neither do they scorn the use of rapping tables with concealed batteries and electric wires.

A most convenient spirit-table is described by Hopkins in his book on Magic, p. 101, as follows :

“The battery is carried in the lower part of the table, where the three legs join. The top of the table is in two parts, the lower of which is hollow and the upper very thin. In the center of the hollow part is placed an electro-magnet, one of the wires of which connects with one of the poles of the battery, while the other is connected with a flat metallic circle glued to the cover of the table. Beneath



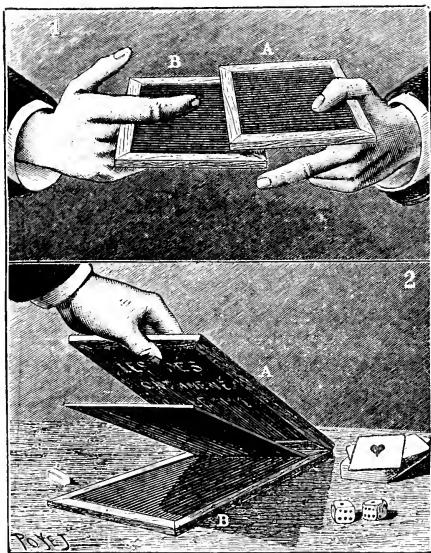
RAPPING AND TALKING TABLE.

this circle and at a slight distance from it there is a toothed circle connected with the whole pole of the battery. When the table is lightly pressed upon, the cover bends and the flat circle touches the toothed one. This closes the circuit, and the electro-magnet attracting the armature produces a sharp blow. When the hand is raised the circuit is broken, producing another sharp blow. By running the hand lightly over the table the cover is caused to blend successively over a certain portion of its circumference. Thus contact is made at a number of places, and the sharp blow is replaced by a quick succession of sounds. This table is very useful for spirit rappings; as the table contains all of the mechanism in itself, it can be moved to any part of the room. The table may be also operated from a distance by employing conductors passing through the legs of the table and under the car-

pet. By substituting a small telephone receiver for the electro-magnet, the rapping spirits may be talking ones."¹

Slate-writing may be done in various ways, and good mediums will always change their methods. One of them is described by Mr. Hopkins as follows :

"Two ordinary wooden-framed slates are presented to the spectators, and examined in succession by them. A small piece of chalk is introduced between the two slates, which are then united by a rubber band and held aloft in the prestidigitator's right hand.



SPIRIT-SLATES.

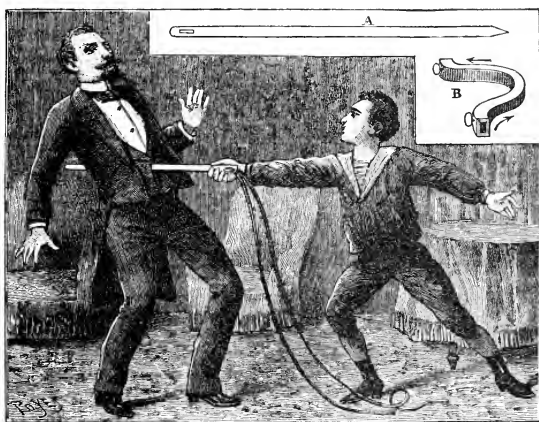
"Then, in the general silence, is heard the scratching of the chalk, which is writing between the two slates the answer to a question asked by one of the spectators—the name of a card thought of or the number of spots obtained by throwing two dice. The rubber band having been removed and the slates separated, one of them is seen to be covered with writing. This prodigy, which at first sight seems to be so mysterious, is very easily performed.

"The writing was done in advance ; but upon the written side of the slate, A, there had been placed a thin sheet of black cardboard which hid the characters written with chalk. The two sides of this slate thus appeared absolutely clean.

¹ A similar table is described by Willmann in *Moderne Wunder*, pp. 58-59.

"The slate B is first given out for examination, and after it has been returned to him, the operator says: "Do you want to examine the other one also?" And then, without any haste, he makes a pass analogous to that employed in shuffling cards. The slate A being held by the thumb and forefinger of the left hand and the slate B between the fore and middle finger of the right hand (Fig. 1), the two hands are brought together. But at the moment at which the slates are superposed, the thumb and forefinger of the right hand grasp the slate A, while at the same time the fore and middle finger of the left hand take the slate B. Then the two hands separate anew, and the slate that has already been examined, instead of the second one, is put into the hands of the spectator. This shifting, done with deliberation, is entirely invisible.

"During the second examination the slate A is laid flat upon a table, the written face turned upward and covered with black cardboard. The slate having been



THE SWORD-TRICK.

sufficiently examined, and been returned to the operator, the latter lays it upon the first, and both are then surrounded by the rubber band.

"It is then that the operator holds up the slates with the left hand, of which one sees but the thumb, while upon the posterior face of the second slate the nail of his middle finger makes a sound resembling that produced by chalk when written with. When the operator judges that this little comedy has lasted quite long enough, he lays the two slates horizontally upon his table, taking care this time that the non-prepared slate shall be beneath (Fig. 2). It is upon it that the black cardboard rests; and the other slate, on being raised, shows the characters that it bears, and that are stated to have been written by an invisible spirit that slipped in between the two slates."

Another very ingenious trick consists in apparently stabbing a man to death, the bloody end of the sword appearing at the back,

yet leaving the man uninjured. Since the audience naturally will suspect that the point emerging from the back is not the true end of the sword, the trick has been altered to the effect of replacing the sword with a big needle (A), having tape threaded through its eye. When the assassin's needle has passed through the victim, it can be pulled out at the other side, together with the tape, where it appears reddened with blood. The stabbing, when performed quickly, before the spectator begins to notice that the blade is somewhat reduced in size, is most startling, and makes a deep impression on the audience; but the artifice through which the manipulation is rendered possible is very simple. The sword, or needle, used for the purpose is made of a very thin and flexible plate of steel, sufficiently blunt to prevent it from doing any harm. The victim, as if trying to ward off the dangerous weapon, takes hold of it and causes it to slip into the opening of a concealed sheath (B), which he carries strapped round his body, whereupon the assassin makes his thrust. The interior of the sheath contains a red fluid, which dyes the blade and helps to make the deception complete. The accompanying illustration sufficiently explains the performance.

A magazine article cannot be exhaustive. But the instances adduced are sufficient to prove that even the apparently most complete deception admits of an explanation which in many instances is much simpler than the spectators think. Neither the marvellous feats of prestidigitators nor the surprising revelations of mediums should make us believers in mysticism. The success of modern magic, which accomplishes more than the old magic or sorcery ever did, is a sufficient guarantee of the reliability of science, and even where "now we see through a glass darkly," we must remain confident that when we grow in wisdom and comprehension we shall learn to see "face to face."

MISCELLANEOUS.

“KANT AND SPENCER.”

To the Editor of The Open Court:

This is Herbert Spencer's eightieth birthday, and a few of his admirers in this antipodean city are sending him a congratulatory message, by cable, for we feel that he, of all English philosophers, has influenced us most.

I have spent part of the morning in reperusing Dr. Carus's pamphlet *Kant and Spencer*, and I would like to say that it seems to me that Dr. Carus has misapprehended Spencer's criticism of Kant.

Much controversy is raised by the use of the word "intuition". I do not think Spencer meant by that word anything different from that which Dr. Carus means. He uses "forms of intuition" to mean just what Dr. Carus calls "pure intuition." The word "intuition" may not be the best translation of "Anschauung", but it is the English word used by various translators and commentators. See Meiklejohn's Translation p. 24, Max Müller's p. 23, Vol. II. Watson *Kant and his English Critics*, G. Croom Robertson's *Elements of General Philosophy*, and others.

I think that perhaps Alfred Fouillée in his *Histoire de la Philosophie* puts the question plainer. He says, pp. 397 and 398, "D'après cela, qu'est ce que l'espace et le temps? Des conditions de notre sensibilité, sans lesquelles nous ne pourrions rien percevoir, des moyens par lesquelles nous émettons nos sensations en séries régulières, . . . Ce sont, dit Kant, des moules ou cadres dans lesquels les choses viennent prendre la forme qui nous permet de nous les représenter; ce sont, en un mot, les 'formes de la sensibilité'." Indeed, Meiklejohn's and Max Müller's translations, which almost agree in this respect, word for word, put it thus, so far as Space is concerned: "It (Space) is nothing else than the form of all phenomena of the external sense, that is, the objective condition of the sensibility, under which alone external intuition is possible."

According to Kant, as Croom Robertson has well said, "The human mind brings to the result of pure sense-experience certain subjective factors, viz., (1) pure intuitions (*reine Anschauung*), in order to perception; (2) pure categories of concepts, in order to understanding; (3) pure ideas, in order to reason." These are transcendental and *a priori*. Now the criticism of Mill, Bain, and Spencer, not to mention others, on this position of Kant is, that these are not transcendental nor *a priori*.

According to Spencer, to take "Space and Time", they have been derived by "accumulated and consolidated experiences", not in the individual alone but

through heredity. To quote the words of Spencer in his Essay "On Space-Consciousness", published in *Mind*:

"It must also be pointed out that since on the evolution-hypothesis, that consciousness of Space which we have lies latent in the inherited nervous system and since, along with those first excitations of the nervous system which yield rudimentary perceptions of external objects, there are produced those first excitations of it, which yield the rudimentary consciousness of the Space in which the objects exist — it must necessarily happen that Space will appear to be given along with these rudimentary perceptions in their form. There will necessarily very soon result something like that inseparability which the Kantists allege. Hence we cannot expect completely to decompose into its elements the Space-consciousness *as it exists in ourselves.*"

It will be seen from this extract wherein the difference between Kant and Spencer in this question lies. According to Kant the forms of Space and Time have not been derived from experience. According to Spencer they have been so derived. Both recognise that the "forms", so to speak, exist. To use Dr. Carus's happy expression they are "at-sights", but their "whence and how" is the question. How have these moulds, if I may use another expression, come to us? There they are, like the mould of the linotype-machine into which the molten lead of experience disappears, but how were these moulds formed? As a thorough-going Evolutionist Spencer says they are the product of ages of experiences. (See his *Psychology*, 2. ed.)

The only quarrel that one might have with Spencer is that at first sight it might appear that Space and Time, as forms of sensibility, are confounded with the abstract idea of Space and Time; a careful perusal of his *Psychology* will show, however, that he did not so confound them (p. 360, Vol. II, *Psychology*). It is plain, I submit, from his Essay I have quoted, that he rightly appreciated Kant's position.

I do not think Dr. Carus has quite apprehended Spencer's position when he says that Spencer believes that Kant said "that Space and Time have no application in the world of objects (i. e., the non-ego)." Spencer puts his position thus: "To affirm that Time and Space belong to the ego, is simultaneously to affirm that they do not belong to the non-ego." Again: "The Kantian doctrine not only compels us to dissociate from the non-ego these forms as we know them, but practically forbids us to recognise *or suppose any forms for the non-ego*". I do not know if a Kantian would object to this statement, save in the words I have italicised. The only "forms of intuition" Kant mentions as existing in order to perception are Space and Time. The qualities of things, etc., are not "forms".

I may add, one point in which a Kantian may complain of Spencer is that he has not recognised that, considering the time in which he lived and his environment, Kant was an advanced Evolutionist. There are passages in his *Anthropology*, which though put cautiously and suggestively, show that he believed that even man was a product of Evolution. Spencer seems to me, however, to be right in saying that a thorough-going Evolutionist must seek for the origin of the "forms of intuition"—Space and Time—in experience; Kant did not do so. Whether Spencer's view is accepted or not, it is on Evolutionist lines and seems to me the only rational explanation given at present of how these forms arose. John Stuart Mill and Bain suffer from the defects of the old English school—of having developed their psychology before the far-reaching results of Evolution—of heredity—were appreciated. This is seen if one refers to James Mill's *Analysis of the Human Mind*, and is also apparent if the first edition of Bain's works be perused.

THE OPEN COURT AND "LEAVES OF GRASS"

To the Editor of the Open Court :

In the January number of the *Open Court* there appeared (amongst other good things) a portrait of the Hon. C. C. Bonney, a representative individual ; an article written by that gentleman on the principles of the *Open Court*, a representative individualistic magazine, an extract of great beauty from the last prose-poem of that (perhaps extreme) incarnation of Individualism—Robert Ingersoll ; and finally an editorial note — not by any means appreciative — respecting the writings of Walt Whitman, whom I have long held to be, *par excellence*, the poet of individualism.

In an article in the March number, *The Jesuits and the Mohammedans*, the writer (Dr. Pfungst) states that the battle between Jesuitism and Republicanism "is at present at its height" ; by that, of course, is to be understood the struggle between Authority on the one hand and Individual Freedom on the other. If that statement be true, it represents a very serious state of affairs, and all your readers and all sympathisers with the *Open Court* idea should do everything in their power to cultivate Individuality in themselves and all those with whom they may be associated, and to encourage the circulation of literature bearing on the subject of Freedom.

Of literature of the kind, I know of none more powerful than *Leaves of Grass*, and I confess to a feeling of some disappointment on reading the admission of the Editor that "there must be something in Walt Whitman" not as the result of his own study, but merely on the authority of Professor W. K. Clifford.

Then the Editor proceeds to remark upon Whitman's "breaches of etiquette" and "immoral penchants," evidently not recognising that—read in their meaning—the *Children of Adam* series is not immoral, that it is not written for the sake of mere obscenity ; for mark these words from *Starting from Paumanok* :

"And sexual organs and acts do you concentrate in me ; for I am determined to tell you with courageous clear voice, to prove you illustrious."

He does not say "to prove you obscene and impure," but "illustrious." True, he may not have taken the most judicious means for robbing Sex of its obscene aspect and rendering it "illustrious" ; but so long as Sex is a tabooed subject for any but physiological literature, so long will the majority of people continue to regard it as impure.

The Editor continues, "his lack of poetic strength" and "genuine sentiment" ; perhaps I am mistaken, but I do wish the Editor would read the *Song of the Open Road* and *This Compost*, and a few of the *Drum Taps*, particularly *Over the Carnage rose prophetic a Voice* ; I cannot help thinking that here he will find both "genuine sentiment" and "poetic strength." Then the "gardner will not wind" blades of grass "into garlands for a bride" ; perhaps not, yet it is as well not to be too sure about that, either ; if the Editor will examine for himself some of the commonest varieties of grasses, he will see what marvelous beauty they possess ; when he has done this and read *Leaves of Grass* in a friendly (and not hypercritical) spirit, I hope he will acknowledge that the beautiful grasses of the fields (and there are no ugly ones) are typical of dear old Walt and his book, and might, in default of Orange Blossoms, adorn even a marriage-feast.

Respecting the lines "Stranger, if you, passing, meet me," etc., the Editor says, "surely there is no objection to a conversation between strangers," and the "thought is trivial and not worth incorporating in a poem." No, from the author of the *Primer of Phitosophy* there can be no objection whatever ; but how many

people are there who live up to *his* philosophy? I take those lines to be an assertion of Equality, which is so closely allied to Freedom and Brotherhood, that the two latter imply the former. Think for a moment how many strangers will voluntarily speak to one another, and then say whether Whitman's lines are justified or not. His own antithesis to the lines in question is this :

"It shall be customary in the houses and streets to see manly affection;
 "The most dauntless and rude shall touch face to face lightly;
 "The dependence of Liberty shall be Lovers;
 "The continuance of Equality shall be Comrades."

The Editor's concluding remark, that Witman's popularity is closely connected with the stir which will always be unfailingly produced by any free discussion of the "questionable passages" is, I think, incorrect; for several years after I had recognised the beauty of *Leaves of Grass*, I did not encounter the book in its complete form—having to content myself with Stead's *Penny Post* edition, the selection edited by Mr. W. M. Rossetti and published by Chatto & Windus, and the little *Canterbury Poet* edition, edited by Mr. Ernest Rhys and published by Walter Scott; and I am fully aware that most of the admirers of *Leaves of Grass* whom I met are quite unacquainted with the *Children of Adam* series, and that some are not even aware of its existence. If in America that is not the case, then all I can say is that the sooner an "expurgated" edition is published there, and the "harmless" poems circulated far and wide amongst the people whom Whitman loved so well, the better.

The Editor complains that "long strings of enumerations are not poetry"; perhaps not; like the Editor, I have never "had the patience to read them through," but it has occurred to me that the author may have had a definite purpose in inserting them, and that perhaps the *Song of the Broad Axe*, which otherwise contains some noble sentiments, would be incomplete without such enumerations. I have no wish to represent Whitman as faultless, and admit that much of his work is "mere talk" and that it is "sometimes shallow."

"Most of the admirers of Walt Whitman belong to the class of eccentrics whose indorsement of a cause is not always a recommendation"; perhaps the present writer is one of these; but, if in this respect he is a sinner, he at least sins in good company; for he has always understood that the lucid *Open Court* contributor, Dr. Moncure D. Conway, was one of Whitman's warmest admirers and friends; in *Liberty in Literature* the late Robert G. Ingersoll extolled and eulogised *Leaves of Grass* and its author; Wm. M. Rossetti (of a poet and artist-family) calls Whitman one of the "great" poets; and *Leaves of Grass* has drawn admiration from such literary men as R. L. Stevenson, Sir Edwin Arnold, Havelock Ellis, Robert Buchanan, J. A. Symonds, John Burroughs, Professor Clifford, and others. These may belong to a "class of eccentrics," but whether or no, I should feel disposed to take their "indorsement of a cause" as "a recommendation."

W. H. TRIMBLE.

DUNEDIN, NEW ZEALAND, April 24th, 1900.

NEW WORKS ON POLITICAL ECONOMY AND POLITICAL SCIENCE.

One of the latest enterprises in the publishing world is the *Citizens' Library of Economics, Politics, and Sociology*, conducted under the general editorship of Richard T. Ely, Professor of Political Economy and Director of the School of

Economics, Political Science, and History, in the University of Wisconsin. It is published by the Macmillans. The design of the library is to "afford such complete information concerning the theory and facts of the three sciences mentioned, that the volumes will have some of the advantages of an encyclopedic work combined with those of separate and distinct treatises." Its new and valuable feature is the giving to the public of information of importance to every citizen, which must now be sought in a great multiplicity of sources, and often sought in vain. We have the explicit statement of the editor to the effect that the "utmost pains will be taken to secure the greatest possible accuracy in all statistic tables and statements of fact and theory, and that no partisan bias will disturb the conclusions." Furthermore, while every attempt will be made to obtain in these volumes clearness of statement and finish of literary style, the interests of science will in no case be sacrificed to popularity, the expressed aim being to bring every volume of the library up to the present standard of science in every respect.

Two of the published volumes of the *Library* are by the editor, Prof. Ely, himself. The first is apparently a reprint of an older work, *Outlines of Economics* (New York and London: the Macmillan Co. Pages, xii, 432. Price, \$1.25), which was begun as a revision of his well-known *Introduction to Political Economy*, but became in the re-elaboration a perfectly new work. The aim of the *Introduction* was to furnish historical and descriptive material chiefly, while the aim of the *Outlines* is to give a systematic sketch of theory. It begins with the traditional "Historical Introduction," and afterwards takes up its subject proper under the following headings: Production, Transfers of Goods, Distribution, Consumption, Public Industry, and the Relation of the State to Private Enterprise, Public Expenditures, and Public Revenues, ending with a sketch of the origin and development of economical theories. The book is a text-book in every sense of the word, and is supplied with summaries of chapters, set questions on the chapters, a list of subjects for essays, discussions, and debates, courses of reading, and a general bibliography. The book is simply and clearly written, and excellently adapted for private study. The second work by Prof. Ely is entitled *Monopolies and Trusts*, and forms part of a very large and comprehensive treatise on which he is engaged, to be called *The Distribution of Wealth*. The book is a timely one. The author believes that he has made an original, though not a definitive, contribution to economic theory, and has presented in a clear manner the main known facts and the main points of view necessary to the study of trusts and trust-legislation. (New York and London: The MacMillan Co. 1900. Pages, xi, 278. Price, \$1.25.)

The Economics of Distribution, by John A. Hobson, is the third published volume of the *Citizens' Library*. It "endeavors to construct an intelligible, self-consistent theory of Distribution by means of an analysis of those processes of bargaining through which economic distribution is actually conducted, the results of industrial co-operation being apportioned to the owners of the factors of production in the several stages of production. . . . In particular, it claims to prove that all processes of bargaining and competition, by which prices are attained and the distribution of wealth achieved, are affected by certain elements of force which assign 'forced gains' and other elements of 'economic rent' to the buyers or the sellers. There is thus established the existence of a large fund, partaking of the nature of those monopoly and differential rents, long ago recognised in the case of land, which furnish no stimulus to voluntary industrial energy, and which can be taken for public service by taxation without injury to industry." Surplus value emerges from all forms of bargaining, but is greater in the case of capitalistic bargainings.

Inequality is ineradicable ; it should be redressed by taxation ; but if that is impossible, public monopolies will have to be substituted for private monopolies. (New York and London : The Macmillan Co. 1900. Pages, vii, 361. Price, \$1.25.)

A second revised and enlarged edition of Dr. Carl C. Plehn's *Introduction to Public Finance* has just appeared. It is intended as an elementary text-book containing a brief and simple outline of the knowledge necessary to prepare students for independent research, brief discussions of the leading principles that are generally accepted, a statement of unsettled principles with the grounds for controversy, and sufficient references to easily accessible works and sources to enable the student to form his opinions for himself. The renewed interest which is now being taken in our system of taxation has given a present import to the financial questions connected with the conduct of the government, and Dr. Plehn's book is one that will help us to inform ourselves concerning the difficulties of the present situation and the most likely paths leading to its reform. (New York and London : The Macmillan Co. 1900. Pages, xii, 384.)

We have at last a text-book on political economy designed especially for farmers. It is by Dr. George T. Fairchild, LL. D., of Berea College, Kentucky, and bears the title, *Rural Wealth and Welfare*. The author believes he need offer no apology for his restatement of the fundamental principles of economics. "Economic literature," he says, "has usually dealt too exclusively with the phenomena of manufactures and commerce to gain the sympathy of rural people." And if the rural population of the country is ever to obtain a sound comprehension of the facts and theories of the science of public wealth and welfare, it can be done only by bringing the subject home to farmers' families in an elementary way, and in connexion with subjects with which they are by experience acquainted. (New York and London : The Macmillan Co. 1900. Pages, xiii, 381. Price, \$1.25.)

Mr. Alfred J. Ferris has presented some very readable considerations in his book, *Pauperizing the Rich : An Inquiry into the Value and Significance of Unearned Wealth to Its Owners and to Society*. They may be regarded by some thinkers as Eutopian ; they may be illogical ; but they at least have the merit of being presented with conviction and naturalness. The central idea of the book is that of a redistribution of incomes on a basis of the people's property in ideas. "We do not wish," the author says, "to repudiate the well-founded claims of the Self-Made Man ; we have no thought of denying to industry its just rewards. But let us render to industry the fruits of its labors : to the whole human race let us render the fruits of its glorious inheritance,—its property of ideas." The author is opposed to the indiscriminate administration of charities, which results in pauperisation, but includes in the "charitable list" of the world all persons who have inherited fortunes and shown themselves unequal to the task of making them productive both for themselves and the human race. He terms this class "millionaires-by-charity," and hence the title of his book, *Pauperizing the Rich*. (Philadelphia : T. S. Leach & Co. 1899. Pages, xiii, 432. Price, \$1.25.)

Every one has experienced the difficulty of obtaining trustworthy information concerning the "Welfare-Institutions" and the profit-sharing systems which numerous employers of labor maintain for their employees ; but the difficulty has been

removed by a recent work by Nicholas Paine Gilman, having the title, *A Dividend to Labor*. "Welfare-Institutions" is the name given in economic parlance to the libraries, hospitals, baths, improved dwellings, theaters, gymnasiums, schools, savings banks, etc., etc. conducted in connexion with the great industrial organisations of the world. They all of them are of the nature of an "indirect dividend to labor," as Mr. Gilman phrases it, and form an intermediate stage between the old wages system pure and simple and the more modern profit-sharing system. Mr. Gilman prefaces his work with an exposition and discussion of existing industrial conditions; narrates the life of Robert Owen, the great English manufacturer, who was a pioneer in this direction; describes the welfare-institutions of Germany, the patronal institutions of France, Holland, and Belgium, the British employers' institutions, and lastly, the numerous but less systematic instances of American liberality to workmen. The most famous cases of profit-sharing institutions are carefully discussed, such as the Maison Baille-Lemaire, the Bourne Mills, the Proctor and Gamble Company, the South Metropolitan Gas Company, and the N. O. Nelson Company. Mr. Gilman is fair to both sides in his expositions, and his work may be consulted with confidence in all cases. (Boston and New York: Houghton, Mifflin & Co. 1899, Pages, viii, 400. Price, \$1.50.)

We have not the space to enter into either a criticism or a discussion of Mr. Charles H. Chase's *Elementary Principles of Economics*. It is a very pretentious book, having been presented to the public in the firm conviction that it will prove to be "the beginning of a *science* of political economy." With all his admiration for the great writers of the past, Mr. Chase is forced to confess that they "have failed to lay a solid foundation for the science in an adequate nomenclature with exact definitions, in the clear and definite statement of the object of economics, or political economy, and in the formulation and statement of the fundamental propositions,"—all of which he believes he has supplied. We shall mention as a specimen of his reflexions the discussion of the standard of value: neither gold, nor silver, nor copper, nor iron, nor any commodity whatever is, in Mr. Chase's opinion, a true standard of value, neither is labor; the true standard is *the average of commodities*—the average price of commodities uniform under all conditions. The practical difficulty, however, is to get hold of this average commodity, and we are consequently obliged to assume a fictitious commodity moving along the lines representing the average change in the labor cost of commodities. The government by its bureau statistics would determine the total amount of new wealth reserved each year for the satisfaction of desires pure and simple. The amount of this wealth would then be divided by the total number of individuals producing it, and the comparison of the resulting quotients for the successive years would give an unvarying unit or standard of value for these several years. (Chicago: Charles H. Kerr & Co. 1900. Pages, xvi, 405.)

Prof. Franklin Henry Giddings, of Columbia University, has attempted in his work, *Democracy and Empire* (New York and London: The Macmillan Co. 1900. Pages, x, 363. Price, \$2.50), the rather difficult task of supplying the psychological, economic and moral foundations of the two popular impulses which are now uppermost in determining the political conduct of modern nations, and for America especially his lucubrations are in the highest sense opportune. His studies in theoretical sociology long ago led him to the belief that the combining "of small states into larger political aggregates must continue until all the semi-civilised, bar-

barian, and savage communities of the world are brought under the protection of the larger civilised nations." And further studies convinced him that the future of civilisation depended largely upon the predominant influence of either the English-speaking people of the world or of the Russian Empire. He saw here a steady trend toward imperialism. On the other hand, he remained convinced "that the democratic tendencies of the nineteenth century are not likely to be checked or thwarted in our own or in future generations." There existed here plainly two antithetical tendencies which demanded reconciliation. There is no mistaking of the real issue. "Democracy and empire, paradoxical as such a relationship seems, are really correlative aspects only of the evolution of mankind." This is the problem of the present crisis, and one which calls for explanation by means of a thorough study of the psychology of society and of the fundamental economical and ethical motives of human effort. The titles of the chapters, which will indicate the general trend and scope of the discussions of this bulky volume, are as follows: The Democratic Empire; The Ethical Motive; The Psychology of Society; The Mind of the Many; The Costs of Progress; Industrial Democracy; The Trusts and the Public; The Railroads and the State; Public Revenue and Civic Virtue: Some Results of the Freedom of Women; The Nature and Conduct of Political Majorities; The Destinies of Democracy; The Relation of Social Democracy to the Higher Education; The Popular Instruction Most Necessary in a Democracy; The Shadow and the Substance of Republican Government; The Consent of the Governed; Imperialism; The Survival of Civil Liberty; The Ideals of Nations; The Gospel of Non-Resistance.

Prof. Frank J. Goodnow has aimed in his *Politics and Administration* to show, "from a consideration of political conditions as they now exist in the United States, that the formal governmental system as set forth in the law is not always the same as the actual system"; and he has coupled with this aim the endeavor "to indicate what changes in the formal system of the United States must be made, in order to make the actual system conform, more closely than it does at present, to the political ideas upon which the formal system is based." All this has involved a study of the operations of our government, of the nature and mechanism of our political parties, and of its distinctive type of leader, the "boss." The concrete remedies which he proposes for the amelioration of the present state of affairs is a greater centralisation of our state administrative system on the model of the national administrative system, and the subjection of the political party to effective public control, with the view of making the parties and its leaders more responsive to the public will. (New York and London: The Macmillan Co. 1900. Pages, xiii, 270. Price, \$1.50.)

Our own nation having entered upon a colonial career in the Philippines, Porto Rico, and in a measure also in Cuba, all thinking Americans will be in favor of establishing a colonial system of civil service which shall be efficient and absolutely free from political pressure. It will be instructive, therefore, to learn what light can be derived from the experience of other nations in this field. Since the excellent work of the late Dormer B. Eaton on English civil service was published, there has been a radical change in the British system, and on the other hand there is no book in any language containing the latest information on the methods of recruiting officials for the colonies of Holland and France. A new book by A. Lawrence Lowell, entitled *Colonial Civil Service* and treating of "the selection and training

of colonial officials in England, Holland, and France," will accordingly be welcomed by students of political affairs. Appended to the volume is an historical account of the British East Indian College at Haileybury, by Prof. H. Morse Stephens. (New York and London: The Macmillan Co. 1900. Pages, xiv, 346. Price, \$1.50.)
T. J. McC.

BOOK REVIEWS AND NOTES.

DER SCHMUCK DES MENSCHEN. By *Emil Selenka*. Berlin: Vita, Deutsches Verlagshaus. 1900. Pages, 72.

This is an extremely attractive book, elegantly got up, with ninety reproductions from photographs taken by Prof. Dr. Hans Meyer, Prof. Dr. M. Buchner, and others on their travels round the world.

The author's problem is the nature of ornament, and the treatment betrays the æsthetician, as does also the style of publication. Seeing that ornament tends to become a part of ourselves, Professor Selenka endeavors to discover the law of ornament as well as its social significance.

Professor Selenka emphasises the fact that ornament is a kind of pictorial language; its purpose is to tell our neighbors of our preferences, be they imaginary or real (p. 13). He compares it to the language of physiognomical expression as treated by Darwin, and regarded among natural scientists as common to all the races of the earth. Further our author insists that he has discovered a law of ornament, and that its development is not a matter of subjective imagination, but of objective facts which, according to him, are determined by the bodily form of man. He distinguishes six kinds of ornament: (1) There are two which are intended to show to advantage man's upright gait, finding expression in hanging ornaments; (2) direction ornaments, which latter are indications of the direction of his movements, as for instance the feathers in the hair of the Indians; further, there are (3) ring ornaments, such as bracelets, collars, etc.; (4) ornaments of aggrandisement, that is to say, things that increase the size of certain limbs,—epaulets and various kinds of headgear; (5) ornaments of color, such as flowers stuck in the hair; and (6) dress to set the color of the body in relief.

These subjects are treated in several chapters, and illustrated by fine figures. The author sums up his opinions with some æsthetic remarks on true and false ornament, and concludes his book on initial and final forms of ornament.

While we appreciate the fact that the book is tastily gotten up and the subject interestingly treated, we cannot help saying that Professor Selenka's discrimination of the various kinds of ornaments dwells on externalities and scarcely touches the main problem he has set out to solve. Our author might have enhanced the treatment of the subject by explaining the historical origin of ornament, which (as anthropology is likely to prove) did not rise from the æsthetics, but *vice versa* is giving rise to conditions which slowly produce an æsthetic instinct. It is a significant fact that all ornament originally served a religious or better talismanic purpose before it became ornament. The first ear-rings, nose-rings, and lip-rings were not worn to satisfy man's æsthetic judgment but served the purpose of protecting these entrances against the influence of evil spirits; so did the amulets which are now worn as ornaments on necklaces. They became ornaments only when their significance as amulets was no longer understood.

An anthropologist might thus be disappointed in the author's treatment of the

subject, but the beautiful pictures alone are worth the price of the book, which we can therefore heartily recommend.

P. C.

CONFUCIUS. The Secret of his Mighty Influence. His views upon the great problem of human life and destiny. By *Thomas Whitney*. Chicago: Seibert, Wermich & Quetsch. Price, 10 cents.

The pamphlet on *Confucius* by Mr. Thomas Whitney is an excellent, short elucidation of the moral principles laid down by the great sage of the Celestial kingdom. Confucianism is the sole religious system in the world, which is established on the ground of positivism, free from all supernatural conceptions and which nevertheless has given comfort to, and has gained the admiration of, millions of souls. As the writer rightly says, "Confucius' doctrine converges at the perfecting of humanity and the making up of the superior man." "To him there was nothing miraculous or supernatural about this. The law of the unfolding of man's spiritual nature was to him as natural as the unfolding of the oak from the acorn, a provision of our nature, innate, the same as is the full fruit in the germ of the seed." The one point, however, on which I cannot agree is the writer's emphasising too much the "Will of Heaven" in expounding the doctrine of Confucius, as if he conceived it as a Christian does. The truth is, to the Chinese mind nothing was so foreign as the idea of a personal God or a willing being above man and nature. The heaven or *tien* was a very vague idea for Confucius, being almost tantamount to the sense of natural law for scientists.

T. SUZUKI.

Mr. F. J. Gould is favorably known as a writer on agnosticism and a populariser of religious history and literature, and we are glad to call attention to two books of his which may suit with the ideas of some of our readers. The first book is entitled *Tales from the Bible* (pages, 103, price, 1s. 6d.), and aims to give a rational view of the Old Testament in a manner suitable to the capacity of children. The author would introduce the child to Bible literature through a simple manual in which the picturesque old legends are related, but accompanies the stories with suggestions and warnings which will prevent children "from believing that all the narratives of the Bible are historical and its teachings pure." In the second book (pages, 176, price, 2s.), he has done the same work for the New Testament, first seeking to make his young readers understand the Gospel, and then if possible "to open to them the natural charm of the early Christian legends." In doing this he "has not scrupled to take away or to add or to modify details." The legend is separated as far as possible from the fact, on the basis of an examination of recent criticism. Some will object to the books that they represent a purely personal, and in many respects a biased, view of the Bible; but this must be true in a large measure of every attempt to make Bible history and literature comprehensible. Mr. Gould has at any rate well brought out the connexion of the whole, and a coherent and systematic impression cannot fail to be produced in the young mind by his stories. With modification of details and in some cases of interpretation, the books might be found of assistance by persons of widely varying opinion. (London: Watts & Co., 17 Johnson's Court, Fleet St.)

The same company has just issued for the Rationalist Press Association a collection of able essays by Mr. J. M. Robertson, entitled *Studies in Religious Fallacy*. Mr. Robertson takes as his text such subjects as Drummond's *Natural Law in the Spiritual World*, Lang's Views on the Origin of Religion and on Miracles,

Mr. Gladstone on the Atonement and on Butler, Freeman on Christianity, Tolstoy on the Ethics of Jesus, etc. (Pages, 227.)

The Rationalist Press Association have also fathered the views of a little book by Joseph McCabe, called *The Religion of the Twentieth Century*, wherein are expounded the tenets of the agnostic faith by a convert from Roman Catholicism. (London: Watts & Co., 17 Johnson's Court, Fleet St. 1898. Pages, 102. Price, 1s.) *The Evolution of Man: His Religious Systems and Social Customs* is the title of a work by Dr. W. W. Hardwicke, issued by the same publishers, and being a compilation of modern views of the development of religion from the point of view of a free thinker. (Pages, xiv, 300. Price, 5s.)

A collection of essays by the leaders of the ethical societies, entitled *Ethics and Religion*, is published to repel the imputation that these societies do not rest upon any philosophical basis. The public, it is said, "is liable to mistake the absence of philosophical theory for a lack of philosophical insight" among the members of the union; but it is contended that this absence may be a proof "of their philosophic discipline and habit, and of their familiarity with the growth of metaphysical systems"; in other words, "that they possibly expect to end, but certainly entertain no hope of beginning, with a system of universal truth." The essays are by J. R. Seeley, Felix Adler, W. M. Salter, Henry Sidgwick, G. Von Gizycki, Bernard Bosanquet, Leslie Stephen, Stanton Coit, and J. H. Muirhead. The majority of them were written ten years ago; they then gave character and direction to the ethical movement, and, being the thoughts of the founders, it is considered important that they should be preserved. (London: Swan Sonnenschein & Co. New York: The Macmillan Co. 1900. Pages, ix, 324. Price, \$1.50.)

We are in receipt of a brochure of 139 pages bearing the title *Hinduism Ancient and Modern as Taught in Original Sources and Illustrated in Practical Life*, by Rai Bahadur Lala Baij Nath, B. A., Fellow of the University of Allahabad. "The object of the publication is to present the teachings of Hinduism, as gathered from its most authentic and recognised sources, on all important phases of the social, religious, and philosophic life of the Hindus, in a simple manner, free from unnecessary details, technicality, and all controversial matter." It is an enlarged and amended edition of some papers contributed by the author to the National Oriental Congresses of Paris in 1797 and of Rome in 1899.

The Annual Literary Index for 1899, by the *Publishers' Weekly* of New York, gives the titles and names of the authors of all the articles which have appeared in the leading American and English periodicals for 1899, an index to the general literature of the year, a list of the American and English bibliographies published in 1899, an index to the dates of the principal events, a necrology of the writers who have died, etc. The index of dates practically serves as an index to the files of any newspaper for 1899. For libraries, newspaper offices, and students who have to consult the literature of the year, this *Index* is indispensable.

One of the latest issues of the *Temple Primers*, noticed at length in the *June Open Court*, is *The Civilization of India* by Romesh C. Dutt. The little book portrays in brief outlines the development of the literature, art, philosophy, science, and industries of India, for some four thousand years, and contains illustrations of several of the most prominent monuments and temples, together with three maps. (London: J. M. Dent. New York: The Macmillan Co. Pages, vi, 146.)

The latest issue of the *Zeitfragen des christlichen Volkslebens* is by M. Reichmann, and treats of the attractive subject of Catholicism and Protestantism in France. The author concludes with the reflexion that whereas the Catholic nations, as political and commercial powers, have succumbed to the Protestant nations, nevertheless there has been built up within Germany an immensely powerful and threatening *imperium* in the shape of the consolidated Roman Catholic interests.

M. Georges Blondel has written an historical and critical study of the Passion Play of Oberammergau in his *Drame de la Passion*, giving also practical hints to travellers purposing to visit Oberammergau this year, descriptions of excursions into the romantic vicinity, the plans of the theater, and two maps. The little brochure costs 1 fr. 25, and is published by Victor LeCoffre, Paris, Rue Bonaparte 90.

Carl Reissner, of Dresden and Leipsic, is the publisher of a series of German biographies entitled *Men of the Day*. Krupp, Nansen, Nietzsche, Liszt, and Windthorst were among the first numbers. The latest is a vivid portrayal of the life and activity of the great German scientist, Ernst Haeckel, by Wilhelm Bölsche. The little book is adorned with a good portrait of Haeckel.

We are in receipt of the first few numbers of a new weekly called *The Indian Review*, published by G. A. Natesan & Co., Madras, India. The scope of the review is a broad one, and not only are the political and literary affairs of India thoroughly discussed, but considerable attention is given to events of importance outside of India. The subscription price is 5 Rs. annually.

The first number of the first volume of the new series of *Le Muséon*, a philological, historical and religious review established in 1881 by the distinguished Orientalist, M. Ch. de Harlez, has been issued, and contains an article on the "Mysteries of the Greek Letters" by A. Hebbelynck, and one on "The Prepositional Verb" by Raoul de la Grasserie, besides reviews.

Emanuel F. Goerwitz's translation of Kant's *Dreams of a Spirit-Seer* has been edited by Mr. Frank Sewall. The little work is a humorous critique by Kant of the philosophers of his day, using Swedenborg as a mark for his blows. Mr. Sewall seeks to show that in his later inquiries Kant was indebted to Swedenborg for some of his most famous philosophical theories.

The editor of *The Open Court*, Dr. Paul Carus, will sail for Europe on July 18, with the steamer *Deutschland*, to participate, as an official delegate from the United States, in the Religious and Philosophical Congresses of the Paris Exposition.

L'Année de l'église for 1899 has appeared. It is the year-book of the Catholic church, and contains the statistics of its condition and operations. The editor is Ch. Égremont. (Paris: Librairie Victor LeCoffre. 1899. Pages, 664.)

Students of Jewish history and literature will find much good advice for pursuing their work and selecting their materials in the syllabus issued by The Chautauqua System of Jewish Education (Philadelphia, P. O. Box 825).



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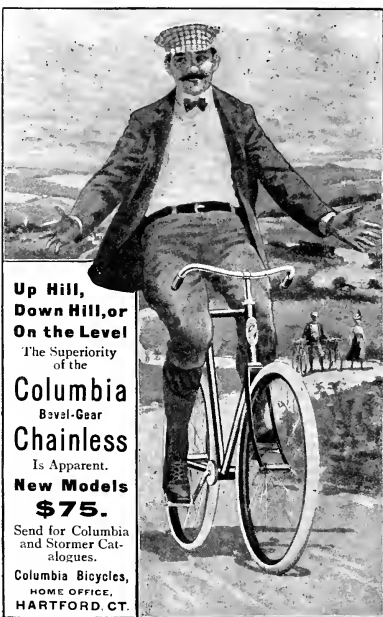
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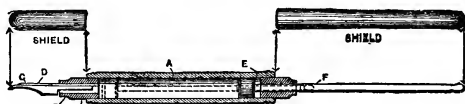
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