CALIGULA'S GALLEYS IN THE LAKE OF NEMI.*

A ROMAN EMPEROR'S WHIM.

BY ST. CLAIR BADDELEY.

THERE are even in Italy few so beautiful spots as the Lake of Nemi. Situated in a deep crater dating from one of the more ancient of five periods of eruption attributed by geologists to the Alban Mountain, it has been likened to a cup with wine glimmering in its depth; and the woods of ilex around it, to a

or the mirror of Diana. It measures but a mile and a quarter across, and four miles in circumference. It is drained off into the western Campagna, and to the sea beyond that, by an ancient "emissarium," or tunnel, 1,640 yards in length, the precise age of which is not yet ascertained.

supplied from a source, at once visible and close to the Temple of Diana.¹ This is borne out by the presence thereby of a copious cascade, to-day known as "La Tempesta," which gushes out of the steep wooded rocks beneath the castle town of Nemi, not far from the site under consideration.

Redrawn from Illustrated London News.

1. Lead plate with embedded nails and an iron-shod pawl. 2. Diver's sketch of the galleys. 3. Moldings of glazed enamel. 4. Mortise and tenon; joint secured by pins (side and plan views). 5. Reconstruction of the deck structure; plan and longitudinal section. 6. Ornamental woodwork. 7. Small roller and hinge. 8. Metal-shod beam. 9 and 10. Diving bells used during the researches of 1539. (From De Marchi's descriptions.) 11. Reconstruction of the Galley of Caligula, from an engraving signed "Del Gallo," sixteenth century. 12. Terra cotta tube (perspective and sectional views); stanchion and section of same; little latch; joint with nails and mortise. 13. Relics from the galleys. Angular hand; above it, lead pipe; to the left, grating; to the extreme left, fragments of the side of the galley covered with sheet lead; at the bottom, bronze rope-rings held in the mouths of animals. 14. Metal caps. 15. How a diver saw Caligula's galley. 16. Nails bent on being driven into knotty wood.

RELICS FROM THE ROMAN GALLEYS IN LAKE NEMI. CALIGULA'S GALLEYS IN THE LAKE OF NEMI.

sacred wreath around the cup. It is a still sheet of water framed in by magnificent gray crags rimmed with dark evergreens, and so completely does silence reign, that during many hours lately spent there, except for the occasional stir of the trees, were heard only two sounds—the deep-tongued bells of Genzano and the croaking of a pair of ravens. Ridge upon ridge above it the forests (formerly the hiding-place of Gasperone) rise up to Monte Cavo, like steps placed there for the gods leading down to this enchanted pool—for ages consecrated to Diana, and still called by the simple country folk "Lo Specchio di Diana,"

* Nineteenth Century and After.

Ovid, Virgil, Propertius, all refer to it as Lacus Nemorensis, a lake (like that at Sicyon and Hoiran Göl), consecrated to the worship of Diana Aricina, and it is obvious that its present title of Nemi derives from its former sacred "nemus" or grove. Strabo says, "The temple of the goddess is in the grove, and the deep lake lies opposite to it. People say that the cult here derives from the Tauric cult of Diana," i. e., the Ephesian. Nevertheless, at whatsoever period it became Hellenized, the name of the Latian goddess survived.

This at once gives the position both of grove and temple. He further declares that the lake water is

In 1885 the late Lord Savile at his own expense opened up a spacious area cumbered with ancient remains corresponding to the position described by Strabo, near the northern margin of the lake; and he was immediately rewarded by finding abundant votive offerings in terra cotta and bronze, which, beyond question, identified the situation of the "Artemisium," or Temple of Diana. Most of these terra cotta objects related to women and to this goddess. It has been possible to find many of these lying about the site until quite lately.

In some other openings, however, but little removed

¹ Strabo, v.

from this first excavation, were found remains of several male terra cotta statuettes. These were more or less fragmentary, and all of them in attitudes indicative of active motion.

One thing was evident, these could have had nothing to do with the essentially feminine cult of Diana Taurica. One of these figures wears around his chest a thong, or fascia, such as were worn by charioteers. With these was found a fine votive vase, upon the body, or bowl, of which is represented, in full action, a horse race, with the "meta" (or goal), and the "ova" (eggs) representing the customary seven rounds of the circus course. Further (and that is an interesting point), four of the "ova" are displayed fallen, showing that three more rounds of the race have yet to be run. The riders are nude, and two griffons (for Nemesis) are seen seizing a stumbling horse, and tearing it. But what would such a vase be doing in precincts of Diana? How can we explain the presence of these distinctly masculine offerings within a precinct peculiarly sacred to a feminine cult?

Possibly the explanation of this may throw light on the significance of the sunken galleys still lying in the adjacent lake. Some writers have attempted to account for the presence there of the famous barges, as having pertained to Diana and her sanctuary, and having been connected perhaps with her picturesque processions on the 15th of August; but it must be confessed that, although ingenious, this hypothesis taken alone is scarcely sufficient to explain all the evidences.²

Let us rather begin by stating that besides Diana there was another divinity worshiped at this place, from prehistoric times; and by name, Virbius. Indeed, tradition recognized this Virbius as the primeval King of the Wood, that is to say, the tree spirit of the oak. In the belief of the Aryan races that tree was the divine accumulator of solar energy, represented by the mistletoe, or golden bough, which grew upon it. When our trees in Europe become leafless and "bare ruined choirs—where late the sweet birds sang," the real life of them is held to have passed into the mistletoe which grows upon them; and, accordingly, in later days, it was regarded as very sacred, and came to be suspended for felicitous usages at the winter solstice, or our later Christmas.

Now, the Latin god Virbius, worshiped at Nemi, was believed each year to rekindle the sun's fire and light, and he was represented there until the fall of the empire by a base-born man who, strangely enough, was regarded as his own reincarnation. Ovid describes this King of the Wood as "strong of hand and swift of foot."³ Besides him, we hear of his priest, or Flamen Virbialis. This priestly post, however, was held in imperial days by one who conjoined with it free birth, the knightly rank, and also magisterial functions—such as "Editorship of the Games."⁴ It will therefore be of no little interest if, in the future, inscriptions be found to throw further light upon the relationship of this well-born priest to the base-born "Rex." For it is a striking fact that the Flamen of Virbius who superintended his cult and sacrifices (about which unfortunately we know but little) should socially be so superior to his master. So far, it is perhaps to be explained only by the notion that the incarnated god, like the man-eating tiger, was bound to lead a degraded life.

The curious conditions pertaining to the Rex Nemorensis are now well known, largely owing to Mr. Frazer's noble volumes entitled "The Golden Bough," in which (as a text for his theory) he recapitulates the various passages in ancient authors relating to the subject.

Pausanias relates that the people of Aricia (i. e., Nemi) told him the old Greek story of Hippolytus having been brought back to life by Æsculapius, and having come from Greece to Aricia and there founded an area sacred to Diana Artemis, "where," he says, "down to my time the priesthood of the goddess is the prize of a victory in single combat. The competition is not open to free men, but only to slaves who have run away from their masters."⁵

Another peculiarity needs be recalled—namely, that no horses were permitted to approach the sacred grove here. This, as Prof. E. Pais has pointed out, was placed in relation with the very name of Hippolytus and with the Hippoi, or unlucky horses, which dragged that hero to his death. That is to say, the Aricians identified Virbius (to whom was dedicated a portion of the neighboring Via Appia, as Clivus Virbius) with the son of Theseus, just as they identified Diana with Artemis. Syncretism had done its work there; and this may have been an attempt on the part of the local authorities to account for the combined cults of Diana and Virbius at Nemi, and their correlation. The latter consisted in the fact that the "Rex," or incarnation of Virbius (doubtless the Sun God), was likewise the hereditary priest of Diana. He was the slayer who must himself be slain, and

the Keeper of the Golden Bough, or mistletoe, in the sacred grove.

Now, this base-born Rex, or "Servus Rex," is without difficulty to be identified with the traditional sixth king of Rome, Servius, who established the federal temple of Diana upon the Aventine Hill, as a rallying point for the Plebs, and a sanctuary for fugitive slaves. For of him, too, we not only hear that he was born of a slave mother, and so called Servius (Tullius), but that he met his death like Hippolytus, being trampled upon by the chariot horses in a street there called Clivus Urbis (i. e., Virbius).⁶ This, as Prof. Pais has demonstrated, points to the conjecture that Servius Tullius may have been the priest of Arician Diana transferred to Rome. There is evidence in Tacitus ("Annales," xiii. 8) of the dependence of the Aventine cult upon that of Aricia.

We are further informed by Strabo that the Rex Nemorensis went about at times armed with a long knife in view of encountering his would-be assassin and successor. This candidate for sanguinary honors, however, had, before doing murder, to cut the mistletoe from the sacred grove and then engage in the mortal combat. If the Rex won (as sometimes no doubt he did), it would be interesting to know that he offered up his fallen antagonist to Virbius or Diana.

But we have not here to inquire further into the causes of this extraordinary procedure. We have, instead, to keep attention upon the fact that the King of the Wood forms the connecting link between Diana and Virbius, and then to adduce a circumstance and one or two facts related of Caius Cæsar (Caligula) by Suetonius in his life of that emperor.

It is therein stated that this interesting tyrant, being of a mind that the reigning Rex Nemorensis had enjoyed his sinecure too long, gave permission to one of his stalwart slaves to go and wrest the priesthood from him, if he could. We do not hear the result of the struggle.

The question arises, Why should Caligula have been interested in such a matter, or in the special priesthood of Virbius and Diana?

If we recall the most salient features of the emperor's daily life we shall find that the two passions, *par excellence*, of this maniac great-nephew of Augustus were (1) for horses and (2) for the water. The latter taste he may have acquired through having been brought up at Capri under the Emperor Tiberius, who once prophetically said of him, "I fear I am rearing a watersnake (*natricem*) for the people of Rome."⁷ At a later day, as if in imitation of Xerxes building his bridge across the Hellespont, Caligula set about constructing one three and a half miles long, from Baiae, in the sea, even to Puteoli (Pozzuoli).

As to his obsession for the circus, the same writer tells us that he was so extravagantly fond of the charioteers of the Green faction that he supped and lodged constantly in the stables where the horses were kept. He made a present of two million of sesterces to one Cythicus, a driver of chariots. The day before the circus games he used to send soldiers to enjoin silence in the neighborhood, so that his favorite horse "Incitatus" (Go-ahead) might not be disturbed. To honor this favorite animal, besides a marble stall, an ivory manger, purple housings, and a jeweled frontlet, he appointed a mansion, fine furniture and a retinue of slaves, to serve for the reception of such as were invited in the horse's name to sup with him. It was even said that he proposed to make him consul.⁸

One especial circumstance (as we have already noted), which has come down to us respecting the cult of Virbius at Nemi, is that no horse was permitted to enter his consecrated precinct. The Romans attempted to explain this by averring that it was because the horses which drew his chariot had killed Hippolytus, son of Theseus, a favorite of Diana, whom (we have already noted) they had learned to identify with Virbius. Pausanias says that at Epidaurus the Temple of Æsculapius contained a tablet recording that Hippolytus on returning to life had dedicated there to Æsculapius twenty chariot horses. It is difficult to say whether his name, signifying the "horse freer," derives from the story, or the story from it. He was possibly a god of hunting or chariot racing; and in all probability was a male counterpart of Diana. At any rate, the connection of Virbius with Diana and Virbius with unlucky chariot horses was quite sufficiently made out to the Roman mind in imperial times. Mr. Frazer and others infer, with much probability, that an annual horse sacrifice, like that to Mars at Rome, was made to him at Nemi. Here, then, it is of interest to remember that the Aventine temple of Diana overlooked the Circus Maximus.

I venture to suggest, therefore, that this chariot racing may in some way have been the very reason for Caligula's attention having been drawn to the Lake of Nemi and its priest-king. Moreover, that the presence on the spot of a votive vase representing a circus race, and the fragments of male statuettes

of charioteers, may be accounted for here by the cult of Virbius, that had been overlaid by the Greek legend of Hippolytus, the favored of Diana. It is manifest that so delirious a devotee of the circus as this emperor had natural reason for holding intimate relations with all divinities connected with the steed, and especially as against evil fortune with it. It was for such a reason, perhaps, that we find him insolently proclaiming his intimacy with Castor and Pollux, the horse-taming sons of Leda and Jove, and exposing himself nude, between their statues in the Forum, in order (it was averred) to obtain a share of their worship. It is manifest that terra cotta statuettes were "votive."

But let us return to Caligula's other passion—that for water, and the things of the water. It was probably on the occasion of his visit to Syracuse, where he exhibited Grecian games, that he first learned about a celebrated galley once made there, by Archimedes, for Hiero to present to Ptolemy, king of Egypt. This amazing vessel obviously amounted to a magnificent floating villa; for besides containing a banquet hall, a library, a temple, and baths, it was adorned with trees, flowers, and fountains, and a piscina. It thus surpassed in its enchantment the Atlantic triumphs of our own day.

Let us recall what Suetonius says further of this extraordinary emperor: "He built two galleys having ten banks of oars, the poops of which blazed with jewels, while the sails were parti-colored. These were fitted up with ample baths, galleries, and saloons, and supplied with a great variety of vines and growing fruit trees. In one of these he would sail in the daytime along the coast of Campania, feasting amidst dancing and concerts of music. In building his palaces and villas there was nothing he so much desired to effect as what was considered impossible."⁹

Now, if he built such amazing galleys, like that of Hiero, for the coast of Campania—mad as such a feat undoubtedly was—to do the like on a little deeply-shut-in lake, like this of Nemi, was surely even more crazy. But here, precisely at this northern end of the lake, there are lying at this moment, at right angles to one another, two galleys such as Suetonius has described; and although they have been locally known for many centuries as belonging to Tiberius, recent research beneath the water has succeeded in appropriating them to their real constructor. For on several lengths of leaden piping laid for the purpose of supplying water in and about these huge galleys, and which have been brought up by the divers, the inscriptions read: "Gaii Caesaris Augusti Germanici"; therefore, unquestionably, they pertain to the son of Germanicus, otherwise to Caligula, and so they must be dated between the years A. D. 37 and A. D. 41. These pipes measure 9 inches in diameter (23 centimeters). This date has been further corroborated by the discovery of tiles bearing the name of Marcus Fulvius Zosimus, which occurs in other imperial structures of that period. Further, the exquisitely realistic sculptures in bronze found among the fittings of the sunken ships only serve to amplify the assurance as to the period to which they belong. Among these occurs an arm and hand slightly archaic, having very square finger nails.

This brings us to the story of archaeological research relating to the subject, and this (it is well known) commences with the fifteenth century. About the year 1435 Cardinal Prospero Colonna, at that time owner of the castles of Genzano and Nemi, the two villages overlooking the lake from the lofty ridge of its crater, having learned that the fishermen not infrequently drew ashore in their nets objects of wood and bronze which evidently belonged to sunken structures, began to inquire how it could be that such should have been constructed there, in a small inland lake surrounded by really high mountains. His curiosity led him to desire closer acquaintance with the strange but undoubted facts. To this end he communicated with Leon Battista Alberti, the celebrated architect of Rimini Cathedral. The latter entered enthusiastically into the subject, and presently devised some large rafts laid upon quantities of barrels, capable of sustaining cranes and great windlasses with which he presently proposed to raise the imagined vessel. He then procured from Genoa expert divers who should descend for him into the lake to ascertain the proportions, and to attach four-pronged anchors and ropes, so as to draw it to land.

One result of this bold experiment was to break off, in the effort, a portion of the stem of the vessel. The operation caused so great a sensation in Rome that crowds of eager folk, including grand ladies of the Pontifical Court, came out of the city in order to inspect the objects discovered and to carry off mementoes. Among these of course were beautiful marbles, plates of lead, and portions of the pipes before mentioned, together with magnificent bronze nails—some even a cubit in length! Flavio Biondo, a contemporary, in his "Italia Illustrata," relates that

² Cf. Mon. Antichi del Lincci, xiii, p. 58.

³ Fasti, iii. 271.

⁴ C.I.L. x. 1493.

⁵ ii, 27, Pausanias (J. G. Frazer).

⁶ Dion Halic. iv. 39.

⁷ Suetonius, Vita Calig. xi.

⁸ Suetonius, Vita Calig. iv.

⁹ All now placed on view in the Museo Nazionale, at Rome.

¹⁰ Suetonius, Caligula, xxxvii.

the wood of which the vessel was constructed was recognized by Alberti to be larch, or "larice." We to-day are enabled to corroborate a curious detail—that externally the vessels were coated with lead, covering a stiff lining of woolen-cloth padding fastened in with bronze studs. The wonderment, however, lasted but a little time. The expense prevented further work.

The operations were, in fact, suspended until 1535, or a century later, when another architect and military engineer, Francesco de' Marchi, of Bologna, was called in to try new experiments for raising the obdurate vessel. He tells us:

"I have seen and touched it with my hands, so I will speak something of that which I know. The ship lies sloping in the lake and near to the shore which looks eastward. Master Guglielmo da Lorena made a contrivance by which he entered the water and made himself descend to the bottom of the lake; and there he remained an hour, more or less, just as he wished, until the cold drove him up again. With this contrivance of his, one can work, sawing, cutting, corking-up, tying ropes; one can also operate with hammers, chisels, pincers and other such tools, though one can use but little force because of the hindrance of the water. When the sun is shining one can see not a little, as when I was there on July 15th, 1535. One views (the object) through a crystal window of about the size of one's palm; and everything seen through it, however small, appears large; much larger than it really is. I say that the fishes called 'Laterini' in this lake, which are no bigger than the smallest finger of one's hand, look as fat as a man's arm and as long as three palms. And had I not known about these fishes I should have been much alarmed, owing to their multitudes. For I carried with me four ounces of bread and one ounce of cheese to eat; and the bread being dry it crumbled; wherefore the fishes came around me in vast numbers, and being without my garments they began to prick me. I drove them away with my hands; but they didn't mind that, feeling that they were in their own house, as it were. I caught one, which seemed quite large; but it proved to be no fatter than my second finger. I carried it above with me, thinking it might weigh thirty ounces, but it proved to weigh no more than twelve. The reason I had no garments on was because in the days of my former master, Duke Alessandro de' Medici, one of the fishermen in the Arno went to fish with his hands and dived beneath the river. There he got caught in the branches of a sunken tree and was drowned. This was my reason. Master Guglielmo wished me to stop up my ears with cotton, musk, etc. But this I forbore to do, lest I should not hear if called. And, although I was not deeper below the water than six 'Canne Romane,' and was called at many times at the top of the voice, I failed to hear and yet I heard well enough the sound of two stones when struck together below the water at half-arm's length, and further. I staid half an hour down there the first time."

He goes on to describe how his nose began to bleed and also his mouth and ears, and he had to give a sign to his comrades to draw him up. He presently plunged in, he says, for a swim, and the bleeding ceased. When next he went down he attached ropes to the wreck and enough of it to load two stout mules was drawn up by the windlass working on the raft above. The wood now proved to be of three species, larch, pine, and cypress; while the pegs were of oak. He found many bronze nails as fresh as if made yesterday. These, he says, fastened the plates of lead on the exterior. There was also a lining of linen between the lead and the timber. Within the ship were pavements of tiles two feet square (bipedales), also segments of red marble and enamel.

"Here were the rooms of the palace, which I did not dare to enter, both for fear of losing myself and also on account of the machine within which I was, which if a man did not keep it upright, he would suddenly be drowned by the water coming in; though one who knew how to swim might save himself by quitting the machine. Master Guglielmo said that there were beams of bronze down there; but I did not see them. We found anchors which had been used in operations in the time of Flavio Biondo. Measuring the ship, we found it in length seventy canne,¹¹ and in width thirty canne, the height from keel to deck eight canne. All my measurements and relics, however, were robbed from me by certain ones who hoped to discover in the material something about the make of this ingenious instrument of Master Guglielmo. But they found nothing; and I have sworn on the Sacrament not to divulge the secret while the Master lives. All I know is that this ship is in this lake, and only one particle is wanting to its completeness, and that is wanting because Master Guglielmo took it away."

Various attempts were made once more, in 1827, by one Annesio Fusconi, an engineer, who used Halley's diving-bell; but the results were unsatisfactory. Nibby, the Roman archaeologist, was present, and came

to the erroneous conclusion, with those who were employed in diving to see the remains, that they must have pertained to a villa which Julius Cæsar is known to have built at Nemi, but which, displeasing him, he destroyed. "He pulled down a villa which he had built from the foundations at Nemi, because it did not exactly suit his taste, although his means were, at the time, but slender."¹²

The real secret of the waters of Nemi, so long and jealously preserved, remained with them until September, 1895, when Signor Eliseo Borghi obtained permission from Prince Orsini to employ divers and make fresh research. Guided by the fisherman, Cav. Vittorio Malfatti and two divers soon located the first of two magnificent galleys that lie therein, at a distance sixty-five feet from the shore. It lies at a depth of thirty feet. At right angles to it, some two hundred feet distant, they found a second ship; and besides these there was found a structure resembling a pier.

By attaching long cords with corks to the galleys, the divers gradually sketched out in outlines on the surface the shape of the vessels. The writer can recollect the feeling of awe which thrilled those looking on at the design developing slowly upon the face of the waters, informing us of the peculiar, if not unique, historic wonders below. The length of the first vessel was found to be ninety feet, by twenty-six in the beam. The decks were found to be paved with elaborate mosaic work in porphyry, green serpentine, and *rosso antico*, intermingled with richly-colored enamel. The bulwarks are cast in solid bronze once gilded, as traces showed.

From other parts of this vessel nearest the shore, which lies in shallower water than its fellow, the divers brought up the various beautiful sculptures besides quantities of fragments confirmatory to the letter of De' Marchi's description as to the structure and ingenious means employed to keep out leaks. The outer edge of the vessel is covered with cloth smeared with pitch, and over this occur folds of thin sheet-lead doubled over and fastened down upon it with copper nails. It may be verified, when a yet more determined attempt shall be carried out to make the lake yield up bodily its treasure, that these great galleys may have been designed by their megalomaniac builder, Caligula, in imitation of those described in Suetonius as having been used by him along the neighboring Campanian coast, for floating villas; but as to their purpose, it is at least as probable they were connected with the cult and festival of Virbius, representative of Hippolytus, the charioteer, as with those of Diana; were it not that the ancients, as well as some moderns, have held that there is immediate relationship between the Moon-Goddess and the lunatic. It may thus have been that the Flamen Virbialis had advised the emperor upon the spot that the "Rex Nemorensis" had enjoyed too long a reign, or had in some way proved tyrannical. This would account for the flip-pant order of the emperor that one of his slaves should challenge him, in order to assassinate him and appropriate his office.

The day when these galleys of Caligula shall be brought to land will be veritably a red-letter day in the archæological calendar; but, owing both to their condition and the depth at which they lie, we may well doubt if that can ever take place.

THE LARGEST COLUMN IN THE WORLD.

THE following account of the largest column in the world is taken from the Boston Mechanic, published in 1835. It was erected by Nicholas, Emperor of Russia, to the memory of his brother, the late Emperor Alexander.

The shaft was placed on its pedestal on St. Alexander Nefsky's day (August 30th, old style, 1832), in presence of the imperial family, nobility, citizens, and strangers. The day was remarkably fine, and an immense concourse—an almost countless multitude—assembled to witness the operation, in the large square in front of the Hermitage, or winter palace of the emperor.

The monument is of red granite, or rather sienite. The pedestal, which is square, is forty feet high; the shaft is round and in one piece, and is eighty-five feet high, and twelve feet in diameter at the top. It weighs six hundred tons and supports a colossal bronze statue, representing an angel holding a cross.

The statue, with its pedestal, including the capital of the column, is thirty-five feet high; and the height of the monument, from the ground to the top of the statue, is one hundred and sixty-five feet. The stone was brought from Finland, and transported to St. Petersburg in a ship built for the purpose, towed by a steamboat.

The inclined plane on which the shaft was rolled from the river Neva to its present site, contained a forest of wood, and cost in that country, where it is so cheap, a million of rubles, or \$770,000. The column was raised and safely placed on its pedestal by means of sixty capstans, manned by 2,500 veterans, who had

served with Alexander in his most glorious campaigns. Each of them wore badges of honor.

The preparations for the stupendous undertaking were so complete that not the slightest accident occurred; and during the operation of raising the shaft, not a whisper or a word was heard throughout the vast multitude who witnessed it; the most profound silence prevailed, and one of our friends, describing his own sensations, says he "felt as if it were criminal to draw a breath."

ARE THE SENSES EVER VICARIOUS?

By JOHN G. MCKENDRICK.

It is a prevalent opinion that if a human being is bereft of one sense, one or more of the other senses become more acute, and thus establish a compensation. For example, it is generally believed that the blind have the senses of touch and of hearing, more especially of touch, developed to a degree of acuteness not found in those who see, and that, in this way, the blind find their way about the world with an accuracy that is often surprising. The blind have even been credited with the ability to discriminate colors by the sense of touch, and some have attempted to support this supposition by an appeal to the sense of heat or cold possibly, for physical reasons, associated with a particular color. A compensating arrangement has also been attributed to the deaf, and more especially to the deaf-blind. Such notions, however, must be abandoned before the evidence of recent investigations.

The question is discussed with much shrewdness in a paper on the physiology of the blind, by M. Kunz, director of the Institution for the Blind at Illzach-Mülhausen. He refers especially to the observations of Prof. Griesbach, made on a considerable number of blind persons in the Mülhausen Institution, and also, for the sake of comparison, on pupils in the public schools of Mülhausen of the same age. The results are somewhat surprising. As regards perception of the direction of sound, there is no difference between the seeing and the blind. The average distance at which sounds could be heard was essentially the same in both classes. As tested by Zwaardemaker's olfactometer, the delicacy of the sense of smell was rather in favor of the seeing. Griesbach used his own æsthesiometer, with parallel pins on springs, instead of the old Weberian method with compasses, in testing the acuteness of touch, with the result that the average minimum distance, say on the tip of the forefinger, etc., at which two points were felt was greater in the blind than in the seeing; in other words, that the seeing had a finer sense of touch than the blind. It is generally supposed that the palp of the forefinger of the right hand, which is used by the blind in feeling the points in Braille's system of teaching the blind to read, must be very sensitive, but this was found not to be the case. Too high a degree of sensitiveness to touch is rather unfavorable to discriminating the points in Braille's type, and it is curious that when, in the blind, the epidermis of the skin covering the right forefinger becomes thickened by manual labor or by laborious practice in "reading," the discrimination of the points becomes easier. It was observed, also, that sometimes in the blind there was a difference between the two forefingers.

There appears to be no evidence, therefore, that blindness, *per se*, increases the sensitiveness of the other senses, but, on the principle that if one sense is defective the others are likely to be also defective, the other senses, in the average blind, are less acute than in the seeing. How, then, are we to explain the wonderful way in which the blind avoid obstacles and find their way about? It has been supposed that by practice the skin of the face, in particular, becomes more sensitive, or, in other words, that the blind habitually pay attention to currents of air playing on their faces, and especially they may be influenced by sensations of temperature. They say that they "know" they are near a wall because they "feel" it, although they do not touch it. It would be interesting to examine the blind as regards the sensitiveness of the hot and cold spots of the skin revealed by Goldscheider and others. The theory of sensitiveness to the direction and temperature of air currents is supported by the observation that the blind do not so readily avoid an obstacle if the face is covered or even if they are blindfolded. This suggests the question: Are all so-called blind people absolutely insensitive to light?

It is also believed that the blind pay an almost involuntary attention to the direction and quality of sounds. The blind man "taps" his stick. When snow is on the ground the blind have difficulty in avoiding obstacles. One must not forget, however, the physical element that enters into the question. The effort of attention is super-added to the sensory impression. Impressions may reach the sensorium of which we are usually unconscious, but they may be detected by an effort of attention. This was strongly pointed out by Helmholtz. The senses of the blind are not more acute than those of normal people, but the necessities of the case oblige the blind to pay attention to them.—Nature.

¹¹ A canna = 6 feet 5 inches.

¹² Suetonius, Julius Cæsar, xlv.

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THE GORGEOUS GALLEY OF CALIGULA AS IT PROBABLY APPEARED WHEN AFLOAT ON LAKE NEMI.

CALIGULA'S GALLEYS IN THE LAKE OF NEMI.—[SEE PAGE 249.]