THE UNITY OF NATURE.

By the Duke of Argyll.

III.

ANIMAL INSTINCT IN ITS RELATIONS TO THE MIND OF MAN.

The Dipper or Water-ousel (*Cinclus aquaticus*) is well known to ornithologists as one of the most curious and interesting of British birds. Its special habitat is clear mountain streams. These it never leaves except to visit the lakes into which or from which they flow. Without the assistance of webbed feet, it has extraordinary powers of swimming and of diving—moving about upon and under the surface with more than the ease and dexterity of a fish—hunting along the bottom as if it had no power to float—floating on the top as if it had no power to sink—now diving where the stream is smooth, now where it is quick and broken, and suddenly reappearing perched on the summit of some projecting point. Its plumage is in perfect harmony with its haunts—dark, with a pure white breast, which looks exactly like one of the flashes of light so numerous in rapid streams, or one of the little balls of foam which loiter among the stones. Its very song is set to the music of rapid waters. From the top of a bank one can often get quite close to it when it is singing, and the harmony of its notes with the tinkling of the stream is really curious. It sings, too, when all other birds but the Robin is silent—when the stones on which it sits are circled and rimmed with ice. No bird, perhaps, is more specially adapted to a very special home and very peculiar habits of life. The same species, or other forms so closely similar as to seem mere varieties, are found in almost every country of the world where there are mountain streams. And yet it is a species having no very near affinity with any other bird, and it constitutes by itself a separate genus. It is therefore a species of great interest to the naturalist, and raises some of the most perplexing questions connected with the "origin of species."

In 1874 a pair of these birds built their nest at Inverary, in a hole in the wall of a small tunnel constructed to carry a rivulet under the walks of a pleasure ground. The season was one of great drought, and the rivulet, during the whole time of incubation and of the growth of the young in the nest, was entirely dry. One of the nestlings, when almost fully fledged, was taken out by the hand for examination, an operation which so alarmed the others that they darted out of the hole, and ran and fluttered down the tunnel towards its mouth. At that point a considerable pool of water had survived the drought, and lay in the paths of the fugitives. They did not at all appear to seek it; on the contrary, their flight seemed to be as aimless as that of any other fledgeling would have been in the same predicament. But one of them stumbled into the pool. The effect was most curious. When the young bird touched the water, there was a moment of pause, as if the creature were surprised. Then instantly there seemed to wake within it the sense of its hereditary powers. Down it dived with all the facility of its parents, and the action of its wings under the water was a beautiful exhibition of the double adaptation to progression in two very different elements, which is peculiar to the wings of most of the diving birds. The young dipper was immediately lost to sight among some weeds, and so long did it remain under water, that I feared it must be drowned. But in due time it reappeared all right, and being recaptured, was replaced in the nest.

Later in the season, on a secluded lake in one of the Hebrides, I observed a Dun-diver, or female of the Red-breasted Merganser (*Mergus Serrator*), with her brood of young ducklings. On giving chase in the boat, we soon found that the young, although not above a fortnight old, had such extraordinary powers of swimming and diving, that it was almost impossible to capture them. The distance they went under water, and the unexpected places in which they emerged, baffled all our efforts for a considerable time. At last one of the brood made for the shore, with the object of hiding among the grass and heather which fringed the margin of the lake. We pursued it as closely as we could, but when the little bird gained the shore, our boat was still about twenty yards off. Long drought had left a broad margin of small flat stones and mud between the water and the usual bank. I saw the little bird run up about a couple of yards from the water, and then suddenly disappear. Knowing what was likely to be enacted, I kept my eye fixed on the spot; and when the boat was run upon the beach, I proceeded to find and pick up the chick. But on reaching the place of disappearance, no sign of the young Merganser was to be seen. The closest scrutiny, with the certain knowledge that it was there, failed to enable me to detect it. Proceeding cautiously forwards, I soon became convinced that I had already overshot the mark; and, on turning round, it was only to see the bird rise like an apparition from the stones, and dashing past the stranded boat, regain the lake,—where, having now recovered its wind, it instantly dived and disappeared. The tactical skill of the whole of this manœuvre, and the success with which it was executed, were greeted with loud cheers from the whole party; and our admiration was not diminished when we remembered that some two weeks before that time the little performer had been coiled up inside the shell of an egg, and that about a month before it was apparently nothing but a mass of albumen and of fatty oils.

The third case of animal instinct which I shall here mention was of a different but of an equally common kind. In walking along the side of a river with overhanging banks, I came suddenly on a common Wild Duck (*Anas Boschas*), whose young were just out. Springing from under the bank, she fluttered out into the stream with loud cries and with all the struggles to escape of a helplessly wounded bird. To simulate the effects of suffering from disease, or from strong emotion, or from wounds upon the human frame, is a common necessity of the actor's art, and it is not often really well done. The tricks of the theatre are seldom natural, and it is not without reason that "theatrical" has become a proverbial expression for false and artificial representations of the realities of life. It was therefore with no small interest that on this, as on many other occasions, I watched the perfection of an art which Mrs. Siddons might have envied. The labored and half-convulsive flapping of the wings, the wriggling of the body, the straining of the neck, and the whole expression of painful and abortive effort, were really admirable. When her struggles had carried her a considerable distance, and she saw that they produced no effect in tempting us to follow, she made resounding flaps upon the surface of the water, to secure that attention to herself which it was the great object of the manœuvre to attract. Then rising suddenly in the air, she made a great circle round us, and returning to the spot, renewed her endeavors as before. It was not, however, necessary; for the separate instinct of the young in successful hiding effectually baffled all my attempts to discover them.

Let us now look at the questions which these several exhibitions of animal instinct cannot fail to suggest; and first let us take the case of the young Dipper. There was no possibility of imitation here. The rivulet beneath the nest, even if it had been visible to the nestlings, had been dry ever since they had been hatched. The river into which it ordinarily flowed was out of sight. The young Dippers never could have seen the parent birds either swimming or diving. This, therefore, is one of the thousand cases which have driven the "experience" school of philosophy to take up new ground. The young Dipper here cannot possibly have had any experience, either through the process of incipient effort, or through the process of sight and imitation. Nature is full of similar cases. In face of them it is now no longer denied that in all such cases "innate ideas" do exist, and that "pre-established harmonies" do prevail in Nature. These old doctrines, so long ridiculed and denied, have come to be admitted, and the new philosophy is satisfied with attempts to explain how these "ideas" came to be innate, and how these harmonies came to be pre-established. The explanation is, that though the efficiency of experience as the cause or source of instinct must be given up as regards the individual, we may keep it as regards the race to which the individual belongs. The powers of swimming and diving and the impulse to use them for their appropriate purpose, were indeed innate in the little Dipper of 1874. But then they were not innate in its remote progenitors. They were acquired by those progenitors through gradual effort—the trying leading to success, and the success again leading to more trying—both together leading first to special faculty; then to confirmed habit, and then, by hereditary transmis

sion, to instinct, "organized in the race." Well, but even if this be true, was not the disposition of the progenitors to make the first efforts in the direction of swimming and diving, and were not the organs which enabled them to do so, as purely innate as the perfected instinct and the perfected organs of the Dipper of to-day? Did there ever exist in any former period of the world what, so far as I know, does certainly not exist now—any animal with dispositions to enter on a new career, thought of and imagined for the first time by itself, unconnected with any organs already fitted for and appropriate to the purpose? Even the highest acquirements of the Dog, under highly artificial conditions of existence, and under the guidance of persistent "interferences with Nature," are nothing but the special education of original instincts. In the almost human caution of the old and well-trained pointer when approaching game, we see simply a development of the habit of all predatory animals to pause when close upon an unseen prey—a pause requisite to verify the intimations of smell by the sense of sight, and also for preparing the final spring. It is true that Man "selects," but he can only select out of what is already there. The training and direction which he gives to the promptings of instinct may properly be described as the result of experience in the animal under instruction; and it is undoubtedly true that, within certain limits (which, however, are after all very narrow), these results do tend to become hereditary. But there is nothing really analogous in Nature to the artificial processes of training to which Man subjects the animals which are capable of domestication. Or if there be anything analogous—if animals by themselves can school themselves by gradual effort into the development of new powers—if the habits and powers which are now purely innate and instinctive were once less innate and more deliberate—then it will follow that the earlier faculties of animals have been the higher, and that the later faculties are the lower, in the scale of intelligence. This is hardly consistent with the idea of evolution,—which is founded on the conception of an unfolding or development from the lower to the higher, from the simple to the complex, from the instinctive to the rational. My own belief is, that whatever of truth there is in the doctrine of evolution is to be found in this conception, which, so far as we can see, does seem to be embodied in the history of organic life. I can therefore see no light in this new explanation to account for the existence of instincts which are certainly antecedent to all individual experience—the explanation, namely, that they are due to the experience of progenitors "organized in the race." It involves assumptions contrary to the analogies of Nature, and at variance with the fundamental facts, which are the best, and indeed the only, basis of the theory of evolution. There is no probability—there is hardly any plausibility—in the supposition that experience has had, in past times, some connection with instinct which it has ceased to have in the present day. The uniformity of Nature has, indeed, often been asserted in a sense in which it is not true, and used in support of arguments which it will not sustain. All things have certainly not continued as they are since the beginning. There was a time when animal Life, and with it animal instincts, began to be. But we have no reason whatever to suppose that the nature of instinct then or since has ever been different from its nature now. On the contrary, as we have in existing Nature examples of it in infinite variety, from the very lowest to the very highest forms of organization, and as the same phenomena are everywhere repeated, we have the best reason to conclude that, in the past, animal instinct has ever been what we now see it to be—congenital, innate, and wholly independent of experience.

And, indeed, when we come to think about it, we shall find that the theory of experience assumes the pre-existence of the very powers for which it professes to account. The very lowest of the faculties by which experience is acquired is the faculty of imitation. But the desire to imitate must be as instinctive as the organs are hereditary by which imitation is effected. Then follow in their order all the higher faculties by which the lessons of experience are put together—so that what has been in the past is made the basis of anticipation as to what will be in the future. This is the essential process by which experience is acquired, and every step in that process assumes the pre-existence of mental tendencies and of mental powers which are purely instinctive and innate. To account for instinct by experience is nothing but an Irish bull. It denies the existence of things which are nevertheless assumed in the very terms of the denial: it elevates into a cause that which must in its nature be a consequence, and a consequence, too, of the very cause which is denied. Congenital instincts, and hereditary powers, and pre-established harmonies are the origin of all experience, and without them no one step in experience could ever be gained. The questions raised when a young Dipper, which had never before even seen water, dives and swims with perfect ease, are questions which the theory of organized experience does not even tend to solve; on the contrary, it is a theory which leaves those questions precisely where they were, except in so far as it may tend to obscure them by obvious confusions of thought.

Passing now from explanations which explain nothing, is there any light in the theory that animals are "automata?" Was my little Dipper a diving machine? It seems to me that there is at least a glimmer shining through this idea—a glimmer as of a real light struggling through a thick fog. The fog arises out of the mists of language—the confounding and confusion of meanings literal with meanings metaphorical—the mistaking of partial for complete analogies. "Machine" is the word by which we designate those combinations of mechanical force which are contrived and put together by Man to do certain things. One essential characteristic of them is that they belong to the world of the not-living; they are destitute of that which we know as Life, and of all the attributes by which it is distinguished. Machines have no sensibility. When we say of anything that it has been done by a machine, we mean that it has been done by something which is not alive. In this literal signification it is therefore pure nonsense to say that anything living is a machine. It is simply a misapplication of language, to the extent of calling one thing by the name of another thing, and that other so different as to be its opposite or contradictory. There can be no reasoning, no clearing up of truth, unless we keep definite words for definite ideas. Or if the idea to which a given word has been appropriated be a complex idea, and we desire to deal with one element only of the meaning, separated from the rest, then, indeed, we may continue to use the word for this selected portion of its meaning, provided always that we bear in mind what it is that we are doing. This may be, and often is a, necessary operation, for language is not rich enough to furnish separate words for all the complex elements which enter into ideas apparently very simple; and so of this word, machine, there is an element in its meaning which is always very important, which in common language is often predominant, and which we may legitimately choose to make exclusive of every other. This essential element in our idea of a machine is that its powers, whatever they may be, are derived, and not original. There may be great knowledge in the work done by a machine, but the knowledge is not in it. There may be great skill, but the skill is not in it; great foresight, but the foresight is not in it; in short, great exhibition of all the powers of mind, but the mind is not in the machine itself. Whatever it does is done in virtue of its construction, which construction is due to a mind which has designed it for the exhibition of certain powers and the performance of certain functions. These may be very simple, or they may be very complicated, but whether simple or complicated, the whole play of its operations is limited and measured by the intentions of its constructor. If that constructor be himself limited, either in opportunity or knowledge, or in power, there will be a corresponding limitation in the things which he invents and makes. Accordingly, in regard to Man, he cannot make a machine which has any of the gifts and the powers of Life. He can construct nothing which has sensibility or consciousness, or any other of even the lowest attributes of living creatures. And this absolute destitution of even apparent originality in a machine—this entire absence of any share of consciousness or of sensibility, or of will—is one part of our very conception of it. But that other part of our conception of a machine, which consists in its relation to a contriver and constructor, is equally essential, and may, if we choose, be separated from

the rest, and may be taken as representative of the whole. If, then, there be any agency in Nature, or outside of it, which can contrive and build up structures endowed with the gifts of Life—structures which shall not only digest, but which shall also feel and see, which shall be sensible of enjoyment conducive to their welfare, and of alarm on account of things which are dangerous to the same—then such structures have the same relation to that agency which machines have to man, and in this aspect it may be a legitimate figure of speech to call them living machines. What these machines do is different in kind from the things which human machines do; but both are alike in this—that whatever they do is done in virtue of their construction, and of the powers which have been given to them by the mind which made them.

Applying now this idea of a machine to the phenomena exhibited by the young Dipper, its complete applicability cannot be denied. In the first place, the young Dipper had a physical structure adapted to diving. Its feathers were of a texture to throw off water, and the shower of pearly drops which ran off it, when it emerged from its first plunge, showed in a moment how different it was from other fledgelings in its imperviousness to wet. Water appeared to be its "native element," precisely in the same sense in which it is said to be the native element of a ship which has been built high in air, and of the not very watery materials of wood and iron. Water, which it had never seen before, seemed to be the native element of the little bird in this sense, that it was so constructed as to be and to feel at home in it at once. Its "lines" had been laid down for progression both in the air and water. It was launched with a motive-power complete within itself, and with promptings sufficient for the driving of its own machinery. For the physical adaptation was obviously united with mental powers and qualities which partook of the same pre-adjusted harmony. These were as congenital as the texture of its feathers or the structure of its wing. Its terror arose on seeing the proper objects of fear, although they had never been seen before, and no experience of injury had arisen. This terror prompted it to the proper methods of escape, and the knowledge how to use its faculties for this object was as intuitive as the apparatus for effecting it was hereditary. In this sense the Dipper was a living, breathing, seeing, fearing and diving machine—ready made for all these purposes from the nest—as some other birds are even from their first exclusion from the egg.

The case of the young Merganser is still more curious and instructive with reference to the same questions. The young of all the *Anatidæ* are born, like the gallinaceous birds, not naked or blind, as most others are, but completely equipped with a feathery down, and able to swim or dive as soon as they see the light. Moreover, the young of the Merganser have the benefit of seeing from the first the parent bird performing these operations, so that imitation may have some part in developing the perfection with which they are executed by the young, But the particular manœuvre resorted to by the young bird which baffled our pursuit was a manœuvre in which it could have had no instruction from example—the manuœvre, namely, which consists in hiding not under any cover, but by remaining perfectly motionless on the ground. This is a method of escape which cannot be resorted to successfully except by birds whose coloring is adapted to the purpose by a close assimilation with the coloring of surrounding objects. The old bird would not have been concealed on the same ground, and would never itself resort to the same method of escape. The young therefore, cannot have been instructed in it by the method of example. But the small size of the chick, together with its obscure and curiously mottled coloring, are specially adapted to this mode of concealment. The young of all birds which breed upon the ground are provided with a garment in such perfect harmony with surrounding effects of light as to render this manœuvre easy. It depends, however, wholly for its success upon absolute stillness. The slightest motion at once attracts the eye of any enemy which is searching for the young. And this absolute stillness must be preserved amidst all the emotions of fear and terror which the close approach of the object of alarm must, and obviously does, inspire. Whence comes this splendid, even if it be unconscious, faith in the sufficiency of a defense which it must require such nerve and strength of will to practice? No movement, not even the slightest, though the enemy should seem about to trample on it; such is the terrible requirement of Nature—and by the child of Nature implicitly obeyed! Here, again, beyond all question, we have an instinct as much born with the creature as the harmonius tinting of its plumage—the external furnishing being inseparably united with the internal furnishing of mind which enables the little creature in very truth to "walk by faith and not by sight." Is this automatonism? Is this machinery? Yes, undoubtedly in the sense explained before—that the instinct has been given to the bird in precisely the same sense in which its structure has been given to it—so that anterior to all experience, and without the aid of instruction or of example, it is inspired to act in this manner on the appropriate occasion arising.

Then, in the case of the Wild Duck, we rise to a yet higher form of instinct, and to more complicated adaptations of congenital powers to the contingencies of the external world. It is not really conceivable that Wild Ducks have commonly many opportunities of studying each other's action when rendered helpless by wounds. Nor is it conceivable that such study can have been deliberately made even when opportunities do occur. When one out of a flock is wounded all the others make haste to escape, and it is certain that this trick of imitated helplessness is practiced by individual birds which can never have had any such opportunities at all. Moreover, there is one very remarkable circumstance connected with this instinct, which marks how much of knowledge and of reasoning is implicitly contained within it. As against Man the manœuvre is not only useless, but it is injurious. When a man sees a bird resorting to this imitation, he may be deceived for a moment, as I have myself been; but his knowledge and experience and his reasoning faculty soon tell him from a combination of circumstances that it is merely the usual deception. To Man, therefore, it has the opposite effect of revealing the proximity of the young brood, which would not otherwise be known. I have repeatedly been led by it to the discovery of the chicks. Now, the most curious fact of all is that this distinction between Man and other predacious animals is recognized and reflected in the instinct of birds. The manœuvre of conterfeiting helplessness is very rarely resorted to except when a dog is present. Dogs are almost uniformly deceived by it. They never can resist the temptation presented by a bird which flutters apparently helpless just in front of their nose. It is, therefore, almost always successful in drawing them off, and so rescuing the young from danger. But it is the sense of smell, not the sense of sight, which makes dogs so specially dangerous. The instinct which has been given to birds seems to cover and include the knowledge that as the sense of smell does not exist to the like effect in Man, the mere concealment of the young from sight is ordinarily, as regards him, sufficient for their protection: and yet I have on one occasion seen the trick resorted to when Man only was the source of danger, and this by a species of bird which does not habitually practice it, and which can have had neither individual nor ancestral experience. This was the case of a Blackcap (*Sylvia Atricapilla*), which fell to the ground, as if wounded, from a bush, in order to distract attention from its nest.

If now we examine, in the light of our own reason, all the elements of knowledge or of intellectual perception upon which the instinct of the Wild Duck is founded, and all of which, as existing somewhere, it undoubtedly reflects, we shall soon see how various and extensive these elements of knowledge are. First, there is the knowledge that the cause of the alarm is a carnivorous animal. On this fundamental point no creature is ever deceived. The youngest chick knows a hawk, and the dreadful form fills it with instant terror. Next, there is the knowledge that dogs and other carnivorous quadrupeds have the sense of smell, as an additional element of danger to the creatures on which they prey. Next, there is the knowledge that the dog, not being itself a flying animal, has sense enough not to attempt the pursuit of prey which can avail itself of this sure and easy method of escape. Next, there is the conclusion from all this knowledge, that if the dog is to be induced to chase, it must be led to suppose that the power of flight has been somehow lost. And then there is the

further conclusion, that this can only be done by such an accurate imitation of a disabled bird as shall deceive the enemy into a belief in the possibility of capture. And lastly, there are all the powers of memory and the qualities of imagination which enable good acting to be performed. All this reasoning and all this knowledge is certainly involved in the action of the bird-mother, just as certainly as reasoning and knowledge of a much profounder kind is involved in the structure or adjustment of the organic machinery by which and through which the action is itself performed.

There is unquestionably a sense, and a very important sense, in which all these wonderful operations of instinct are "automatic." The intimate knowledge of physical and of physiological laws—the knowledge even of the mental qualities and dispositions of other animals—and the processes of reasoning by which advantage is taken of these,—this knowledge and this reasoning cannot, without manifest absurdity, be attributed to the birds themselves. This is admitted at least as regards the birds of the present day. But surely the absurdity is quite as great if this knowledge and reasoning, or any part of it, be attributed to birds of a former generation. In the past history of the species there may have been change—there may have been development. But there is not the smallest reason to believe that the progenitors of any bird or of any beast, however different in form, have ever founded on deliberate effort the instincts of their descendants.

[*To be Continued.*]

PROFESSOR JAMES C. WATSON.

Professor James C. Watson, Director of the Observatory of the University of Wisconsin, died at Madison, Wis., on the morning of November 23, after an illness of but three or four days.

Professor Watson was born on January 28, 1838, and was therefore nearly 43 years of age. He graduated at the University of Michigan in 1857, remaining there as instructor and Professor of Mathematics and Astronomy till 1863, at which time he was made Director of the Ann Arbor Observatory. He held this position till 1878, when he accepted the Directorship of the Washburn Observatory at Madison. He made observations upon the total solar eclipse of 1869 in Iowa, and that of 1870 in Sicily; and in 1874 had charge of the very successful American Expedition, which observed the transit of Venus at Peking, China. In 1870 he received the Lalande gold medal from the French Academy of Sciences, for his various astronomical works and discoveries. His most elaborate writings are: *A Popular Treatise on Comets* (1860) and *Theoretical Astronomy, relating to the Motions of the Heavenly Bodies revolving around the Sun in accordance with the Law of Universal Gravitation, with Numerical Examples and Auxiliary Tables* (1868). In addition to these, he has published from time to time, in *Gould's Astron. Journ.*, *Astron. Nach.*, *Am. Journ. of Sci.*, etc., short papers relating, for the most part, to the discovery and observations of asteroids, and the computations of comet orbits. For several years he gave especial attention to the search for asteroids, and in this work was eminently successful, discovering, in all, twenty-one of these bodies, between the years 1863 and 1877. At the time of his death, Professor Watson was engaged in building and equipping one of the finest observatories in America. The meridian circle, which is to contain several new features suggested by himself, is now in the hands of the Clarks, and will not be finished, probably, for nearly a year. Other instruments of the highest order are either already mounted and in operation, or are in course of completion. Careful preparations had been made also for a systematic search for the planet Vulcan, a problem in which Professor Watson was deeply interested. W. C. W.

THE AMERICAN SOCIETY OF MICROSCOPISTS.

(From advanced sheets of *American Naturalist*, for December; Microscopical Department under the direction of Dr. R. H. Ward.)

Probably no thoughtful person who attended both meetings this summer, the American Society of Microscopists at Detroit, and the Subsection of Microscopy, A. A. A. S., at Boston, failed to notice the nearly equal division of strength between the two conventions. The personal attendance at the meetings was about equal, though mainly of different individuals; the number of papers read was precisely the same, and it is only fair to say that in interest and importance they were very evenly divided. It is obvious that if the strength of the two meetings could have been combined in one, the result would have been far more adequate and satisfactory. This reflection has derived force from the well known fact that in the Microscopical Congress at Indianapolis, nearly half the voices were in favor of joining with the A. A. A. S., instead of forming a separate society, the latter course being adopted in the critical vote by a majority of one. From first to last, it has been of great and conceded importance to combine all our strength in one enterprise; but the obstacles which originally rendered this impossible, still remain, and it is evident that indiscreet controversy might increase and perpetuate the difficulties it was designed to remove. It would be absurd to ask persons, accustomed to attend the meetings of the great society, and highly valuing its opportunities for intercourse with leading minds in various departments of science, to abandon that for any narrow organization, however attractive might be its field. On the other hand the new society could not profitably be united with the old, as has been proposed, without a more cordial and general support of such a procedure than could at present be hoped for. The subordination to greater interests, which would be encountered in uniting with the great society would be more than counterbalanced, in many minds, by the social and scientific advatages gained; and the fact that many of the papers read would be excluded from the Proceedings by a necessity which admits only contributions new to science, would be of little consequence, since popular papers gain an earlier and a wider distribution through the popular journals; but a more serious difficulty arises from the localities in which the meetings of the A.A.A.S., are sometimes held. The large and powerful society can afford to appoint meetings, not unfrequently, for the sake of cultivating local interest in science, in localities which would be unavailable for the microscopical meetings. A joint meeting at Boston would have given a large increase of vitality; the same will not be equally true of all other localities.

If for these or any other reasons, it should be impracticable to combine the two societies at present, the greatest advantages would doubtless be secured by such a policy as would show, on both sides of the question, a reasonable and considerate regard for the interests of the other. The very large minority at Indianapolis acquiesced in the formation of a new society with the understanding that the times and places of meeting were to be so chosen as to best accommodate those who might wish to attend both. This policy, if fully carried out, would not prevent meeting at the same place when expedient, and would not require it when some other correlated place would be advisable. It would give many of the advantages of union, with entire freedom from its difficulties. It is the least that could in reason be asked, or that could in common courtesy be granted, as a means of securing a cordial and harmonious support for the new society.

THE first number of a periodical, devoted to the subject of instruments, will be issued January 1, 1881. It will be published in Berlin under the name of the "Zeitschrift für Instrumentenkunde," and will be prepared by a board of twenty-one editors, including the most noted instrument makers of Europe and representatives of different branches of science in which instruments of precision are employed. Such a periodical is greatly needed, and the names of the editors are a guarantee of its success. O. S.