Konrad Lorenz 1956
Plays and Vacuum Activities

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Seitenumbrüche und -zahlen wie im Original.
Plays and Vacuum Activities

When Monsieur le Professeur Grasse invited me to talk about the relations between play and vacuum activity I said in my answering letter that I did not know enough about the subject to justify a lecture. In turn he answered that I should say as much as I know. So, this presentation will be very short and will not propose to do more than give a few hints which might lead to a fruitful discussion. Do not ask me to give a definition of play. There is a good excuse for naively using a word of common parlance even if one cannot give an exact definition of the concept corresponding to it: very usually there is a real natural unit corresponding to a concept for which the natural growth of common language has developed a word. So let us use the word «play» just as every man in the street would use it naively when talking of the play of kittens or even little children. Whenever we observed higher mammals at play, puppies «playing at» fighting each other, kittens «stalking a ball of wool» or kids gamboling on the grass there is no doubt about the playful motive of these activities although the motor patterns observed are actually very similar to certain instinctive movements which may be used in deadly contest. Still, they differ in sufficiently many characters to be clearly distinct from what we call vacuum activities. These differences, however, become smaller and smaller as you go down to lower Mammals and inframammalian Vertebrates. A little Rabbit, being released from close confinement, is apt to gambol, much like a Colt, and like it also shows motor patterns really pertaining to escape reactions. But, unlike the Colt, the little rabbit tends to get into real panic, and, after a while zigzagging, takes cover and crouches, quite as if it were seriously afraid.

And this is exactly what does not happen in higher Mammals. The usual opposition between play and being serious has a very real background, although the coordination of movements which we can observe in play is obviously identical with those of true instinctive motor patterns which, in their serious
application, perform a function of very definite survival value. The Colt's play shows a number of movements the serious function of which is to throw off a Lion or Tiger that has jumped on a horse's back: the sudden jump with all four legs combined with an arching of the back and all other manoeuvres of bucking familiar through the Wild West Show. The «Capriole», intentionally developed by the Spanish Riding School, corresponds to an instinctive movement of analogous function. In spite of showing movements belonging to very desperate measures of escape the little Colt evidently is not afraid, which it very clearly proves by the fact that it can very suddenly cease from performing these movements in order to begin to graze or to relapse into quiescence. This behaviour is very different from what you might observe in a Horse that gets panicky in a real vacuum or explosion activity, in which case even after the quietening down the animal will be for a considerable time extremely sensibilized to all stimulations which elicit escape and also will show very noticeable phenomena on the side of the vegetative nervous system. Objectively speaking, the single movements of escape are dissociated from what ethologists call the general mood, that is to say the readiness to perform any kind of escape activities.

This mood can be roughly qualified by ascertaining the threshold of stimulation necessary to release instinctive movements. In the case of vacuum activities this threshold is lowered to the extreme so that negligible stimuli, unnoticeable to the human observer, are enough to bring about a highly intensive response. The question whether there is a considerable threshold-lowering or not is, as far as I can see, the only objective means of distinguishing between «play» and vacuum activities. If you play with a Dog or Cat which performs all kind of fighting movements in play and start to handle it rather roughly you will find that the animals threshold of getting angry is certainly not only not lowered, but, if anything, heightened by its playful fighting activity. With less highly developed Carnivora this is not the case. Badgers, for instance, are apt to get seriously angry while playing if you handle them too roughly and a playful fighting merges imperceptibly into a real one.

If we apply the term «play» to all instinctive movements which are performed independently of the proper releasing object and also without any threshold-lowering, we must attribute the ability to play not only to Mammals, but also to Birds. Anatidae perform, during their daily bath, all the motor patterns serving to escape from a flying enemy, like, for instance, a Sea-eagle. Yet, the birds are definitely not in a panic and the escape play ceases as suddenly as it does in the higher Mammals. It would seem, after what has been said, that the instinctive movements performed in play are not activated along the usual paths and not by the source of their common autochthonous motivation. To explain what I mean I should like, at this point, to mention a result of W. R. Hess: in the experiment in which he stimulated certain localities in the hypothalamus of the Cat, he found, amongst other similar «centres», the locality whose stimulation elicited fighting activity in the Cat. By stimulating this point he got the Cat into a real rage, or, objectively speaking, into a high
readiness to fight. With weak stimulation, the Cat showed a threshold-lowering of fighting, showed true appetitive behaviour in «looking for trouble» that is to say searching for a substitute object. This it usually found in the person of the assistant of Professor Hess. With stronger stimulation the threshold would show further lowering, resulting at last in an explosive fighting activity performed with any object, and, in this regard, very similar to an explosion or vacuum activity. If the point of stimulation was shifted a few millimeters in the caudal direction its result was not a generalized readiness to fight. The fighting threshold remained unaltered, it was still possible to elicit other responses like eating, purring etc. Only with higher intensity of stimulation there appeared, quite suddenly, dissociated motor patterns of fighting like spitting or a blow of the paw with extruded claws.

It is very tempting to interpret this result in the terms of Tinbergen’s theory of the hierarchical organisation of instinct. The first, more cranial locality stimulated a centre on a more highly integrated level of this hierarchy, the second one the lower centre of a single motor pattern. It seems to be characteristic of «play» that instinctive movements are thus performed independently of the higher patterns into which they are integrated when functioning «in serious». A very good example of this is the play of a little kitten. It will suddenly crouch, lift the hind legs alternately and make a very interesting aiming movement with its head, all of which is photographically identical with what the adult Cat does in stalking a Mouse. The kitten, however, thus, «stalks» one of its siblings, rushes at it, clasps it with both front paws and performs rhythmical thrusts at the other with the hind legs. This, again, is a movement performed in a serious fight between adult Cats. Alternately the kitten, jumping at the other, may suddenly stop, stand broadside to its opponent, hunch its back and ruffle the hair of its tail, in other words, assume an attitude characteristic of the serious defense against a dangerous predator. It is only in play that these movements can follow each other in such quick succession. The autochtonous readinesses for hunting, rival fighting and defense against predators are mutually exclusive or at least inhibitive.

The source of excitation feeding play activities must be different from the autochtonous one. In this point play may be more akin to displacement activities than to vacuum activities. The unspecific source feeding, in play, single motor patterns belonging to quite different instincts is apparently flowing very richly in some cases. For instance, the real stalking and rushing at prey seems to be very exhausting in many Carnivora, yet in play it can be repeated almost indefinitely.

Thus, activities which, when performing their serious function, bear the character of consummatory acts, do not so when performed in play. This, though expressed in physiological terms, obviously describes the same set of facts which Professor Bally means when he says that play is an activity in a field devoid of tension, («im entspannten Feld») and, at the same time, belonging to the appetitive sector of instinctive behaviour.
Very many years ago Karl Groos has drawn attention to the fact that play itself may develop a very definite survival value to the species, because the young animal practises in play its instinctive movements and learns important things about their application. There is, obviously, much truth in this statement which, incidentally, makes intelligible why play is more important in young animals than in old ones. However, we do not believe that instinctive motor patterns need practising or are susceptible to improvement through practice. This is also borne out by the fact that play is most prominent in species which combine a minimum of equipment of instinctive movements with a maximum of exploratory learning. Let me illustrate the exploratory side of play by describing the behaviour of a young Raven. The Raven is, on its level, the very prototype of what we call a «curiosity creature». The instinctive motor patterns which it commands are comparatively few and very highly specialised. But this very lack of specialisation ensures a very broad applicability of these instinctive movements while, of course, highly specialised ones, just like highly specialised tools, can only be applied in one particular situation. To the wide applicability of these movements corresponds a wideness of innate releasing mechanisms. Indeed, these responses show such an extreme lack of selectivity that one is tempted to say they have no innate releasing mechanism at all, that they will go off in practically any stimulus situation until the animal has learned, through conditioning, where to perform them. A young Raven, confronted with a new object, (which may be a camera, an old bottle, a stuffed polecat or anything else) first reacts with escape responses. He will fly up to an elevated perch and, from this point of vantage, stare at the object literally for hours. After this he will begin to approach the object very gradually, maintaining all the while a maximum of caution and the expressive attitude of intense fear. He will cover the last distance from the object hopping sideways, with half-raised wings, in the utmost readiness to flee. At last, he will deliver a single fearful blow with his powerful beak at the object and forthwith fly back to his safe perch. If nothing happens he will repeat the same procedure in much quicker sequence and with more confidence. If the object is an animal that flees the Raven loses all fear in the fraction of a second and will start in pursuit instantly. If it is an animal that charges he will either try to get behind it and tease it by trying to repeat the attack or, if the charge is sufficiently impressive, loses interest in a very short time. With an inanimate object the Raven will proceed to apply a number of further instinctive movements. He will grab it with one foot, peck at it, try to tear off pieces, insert his bill in any existing cleft and then pry apart his mandibles with considerable force. Finally, if the object is not too big, the Raven will carry it away, push it into a convenient hole and cover it with some inconspicuous material. I would like to draw attention to the fact that this young bird performed nothing but a series of innate instinctive movements which, in the adult bird, serve definite purposes. They certainly look as if they all belonged to one chain of appetitive behaviour aiming at eating. It is easy, however, to show that this is not the case: curiously
enough, all this exploratory play of the young Raven is strictly dependent on the fact that the young bird is not hungry. The moment he gets really hungry he would relinquish his play instantly and start pursuing me with violent food-begging. This is a beautiful example for BALLY’s conception of play as appetitive activity in a tension-less field.

Anthropomorphically speaking, the Raven does not want to eat this object, what he does want is just to know whether it is eatable in theory. This curious analogy to basic research in humans is certainly not without a very high survival value to this type of animal. By treating each new situation as if it were biologically relevant — first as a potential enemy, then as a prey — the Raven will discover sooner or later the relevant objects in very different habitats. This is exactly why the Raven can live just as well as a parasite of sea-bird colonies in the north like a Skua, as a carion-eater in the desert like a Vulture or as a hunter of small animals in Middle Europe. Into each habitat he fits as if he were specifically adapted to it while, in reality, the adaptation is only individually acquired. Practically all larger animals that have become cosmopolites belong to «specialists for non-specialisation». Besides, the Corvidae, the Norwegian Rat and Man are the most striking examples of this biological type. As regards the bodily structure it is typical of all of them that they are «primitive» in the sense that they lack highly differentiated specialisation. In their behaviour the extreme «curiosity», e. g. tendency to exploratory learning and a comparatively simple equipment with instinctive movements are characteristic of them all.

Of course, exploratory play is not only dependent on non-specialisation, but also on the absolute level of neural organisation. A Chimpanzee is much more specialised than a Rat, still its exploratory learning plays as much of a role as it does in the Rat. A baby chimp at play is a subject worth of deep meditation. Of course, the neoteny of Man is sufficient to explain why baby Anthropoids are so much more human than adult ones. Yet, watching a baby chimp at play I never can help feeling that there may be still another explanation: it is not impossible that the latest common ancestor of Chimpanzee and Man was much more human than the present Chimpanzee is, which, being a specialist, has got into a blind alley of mental development. It is quite possible that we see in the young chimps’ play a vestigial form of exploratory behaviour which was much more developed and important in its ancestor. Of course this is pure speculation and I beg you to regard it as such.

BIBLIOGRAPHY


**DISCUSSION**

M. KLEIN. — Dans mon rapport, j'ai mis en place, mais en la laissant entièrement ouverte, la question si complexe des relations entre les jeux sexuels et le comportement sexuel allant jusqu'au rut. Ce problème se pose même chez les espèces de laboratoire dont les activités de «jeux» sont plus riches qu'on ne le croirait au premier abord. Ceci est le cas chez le Lapin, chez le Rat et surtout chez le Hamster doré (*Mesocricetus auratus*) sur le comportement duquel ont été publiées des données dès 1935 par Bruce et Hindle, par Ruth Deanesly et par moi-même.

Le Professeur Lorenz voudrait-il nous préciser la notion de vacuum activity. S'agit-il d'une activité sans but, ou d'une activity lancée avec suffisamment d'énergie pour pouvoir ensuite se dérouler tout comme la roue libre d'une bicyclette?


Spielbewegungen sind tatsächlich oft noch konservativer als die Instinktbewegungen, von denen sie sich herleiten. AHLQUIST fand bei den Lariden
Sterna und Stercorarius (Seeschwalben und Raubmöwen) bei Jungvögeln eine bestimmte Bewegungsweise des Fischens wieder, die den erwachsenen Vögeln dieser hochspezialisierten Genera völlig fehlt, bei den weniger spezialisierten Möwen, wie beim Genus Larus und bei den Lachmöwen, Hydrocoloeus, aber eine durchaus funktionelle Instinktbewegung des Nahrungserwerbes ist.


P. P. GRASSÉ. — Je tiens à rappeler que, dès 1944 et a diverses reprises, j'ai signalé les activités apparemment sans objet, sans utilité que manifestent les ouvriers de Termites en maintes circonstances. Une termitière est une construction qui, à l'égal d'un organisme vivant, passe par divers stades avant d'atteindre son complet développement; mais elle est aussi le siège d'incessants remaniements: des cloisons sont abattues, des cellules sont démolies; les unes et les autres sont reconstruites à peu près dans leur état primitif. Aucune nécessité sociale ne paraît imposer de telles «absurdités». J'ai qualifié de vide ces activités, tout exprimant des réserves sur leurs éventuels rapports avec les activités désignées par le même adjectif chez les Oiseaux et les Mammifères. J'ai également posé le problème de la liaison possible des activités «vides» des ouvriers de Termites avec le rythme d'activité, d'origine interne, de ceux-ci.

K. LORENZ. — Ich weiss nicht ganz, ob man die von Prof. GRASSÉ beschriebenen «unnötigen» Baubewegungen von Termiten ohne weiteres dem Spiel gleichsetzen darf. Ich glaube gewiss, dass sie funktionslos sind. Mein Lehrer HEINROTH legte sehr grossen Wert auf die Tatsache, dass es in der Morphologie und im Verhalten der Tiere nicht nur das gibt, was einen positiven Arterhaltungswert besitzt, sondern auch alles, was keine so starke negative Selektion bewirkt, dass das Leben der Art in Frage gestellt ist. Ich glaube aber doch, dass nicht jede derartige, funktionell überflüssige Verhaltensweise unter den Begriff des Spiels fällt, so vage und ungenau wir diesen auch nur zu fassen vermögen.

H. HEDIGER. — Das Spiel erweist sich in der Tat als eine höhere Leistung. Das geht u. a. auch aus seiner Verbreitung im zoologischen System hervor;
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Der fakultative Charakter des Spiels für das in der gefahrvollen Freiheit lebende Tier geht auch daraus hervor, dass es meineswissens kein einziges Spielorgan gibt, während man sonst für jede andere mögliche Tätigkeit entsprechende körperliche Ausbildungen findet. Im Gegensatz zu anderen Tätigkeiten wie Fressen, Defäzieren, Kämpfen usw. konnte der Zürcher Physiologe W. R. HESS im Gehirn der Katze kein Spielzentrum finden, das sich durch die eingeführten Elektroden wie die anderen reizen liesse.

Es gibt Spiel-Typen, welche durchgehend bei Tier und Mensch vorkommen, z. B. das Festungsspiel («King o'the castle»): ein Partner stellt sich auf eine Bodenerhöhung und der andere muss ihn herunterstossen und selbst vom Hügel Besitz ergreifen. Und wie bei Kindern, so kann auch bei Tieren das Spiel allmählich in Ernst (Kampf) übergehen, wie auch Flucht und Spiel intim miteinander verbunden sein können. In der hupfenden Fluchtreaktion der Impala — und Topi — Antilopen sind offensichtlich spielerische Elemente eingelegt, die durchaus den Eindruck von motorischen Extravaganzen, von Luxusbewegungen im Sinne von H. KRIEG machen.

Dagegen möchte ich der Ansicht widersprechen, dass das Spiel ein für die Arterhaltung indifferenter «Ludus naturae» sei. Wir alle leben davon. Wenn ein Rabe imstande ist, sich in der nordafrikanischen Wüste als Aasfresser genau wie ein Geier zu ernähren, in dem so völlig andersartigen Biotop einer Meeresvogelkolonie aber genau wie eine Raubmönche, und in beiden Fällen genau so, als sei er Spezialist für gerade diesen Lebensraum, so verdankt er diese Fähigkeit ausschließlich jenem exploratorischen Lernen, das schlechterdings jeden unbekannten Gegenstand als potentiell biologisch bedeutungsvoll behandelt, und auf diese Weise unter denkbar verschiedensten Bedingungen Lebensmöglichkeiten herausfindet.

Nur unspezialisierte Neugierwesen sind zu Kosmopoliten geworden, wie schon unter den Vögeln die Corviden und unter den Säugetieren die Wanderratte und der Mensch. Sie alle leben von ihren sachlichen Forschungen.


Ein besonderes Kapitel wäre die Spielphantasie, das Symbolisieren, das zweifellos auch weit in die Tierwelt hinabreicht.

K. LORENZ. — Ich stimme allem bei, was Professor KOEHLER gesagt hat: Ich habe absichtlich den Menschen nicht in meine Betrachtungen einbezogen, aber alles was Herr Prof. KOEHLER über das explorative Erwerben von kleinsten Einzelkenntnissen beim Säubling sagte, gilt zweifellos für alle jene «Spezialisten für Nicht-spezialisier-Sein», von denen ich gesprochen habe. Insbesondere aber für deren typischsten Vertreter, die Wanderratte. Ich möchte Herrn Dr. LEHRMANN gegenüber betonen, dass ich völlig bereit bin zu glauben, dass die primitiven Kenntnisse über Mechanik, die allem komplexeren Verhalten zugrunde liegen, tatsächlich durch Versuch und Irrtum erworben werden. Ich glaube zwar im speziellen Fall nicht, dass die Ratten das «Eintragen von Gegenständen im Allgemeinen» erlernt haben müssen, um ihre Jungen eintragen zu können, — und zwar deshalb nicht, weil auch viele Nager existieren, die nur ihre Jungen eintragen und keine Nahrungsvorräte anlegen, und weil es verschiedene alternative Erklärungen für das Versagen jener Versuchstiere gibt. Ich glaube aber durcharaus, dass im Prinzip ähnlich funktionierende
Lernvorgänge eine ganz gewaltige Rolle im Verhalten derartiger Tiere spielen, welches im Übrigen einen hohen Grad von Art-Voraussagbarkeit (species predictability) besitzen kann.

J. B. S. HALDANE. — Croyez-vous que l'on peut qualifier le jeu comme un des points de croissance du comportement, soit dans l'ontogenèse, soit dans la transformation évolutionnaire? Est-ce que les vols explorateurs des Abeilles sont des jeux? Ils n'ont pas de but immédiat, mais donnent des connaissances du terrain nécessaire pour des retours futurs. Je note que le mot latin «ludus» peut signifier ou bien un jeu, ou bien un exercice d'école, comme la traduction du Grec. Le titre de M. LORENZ est presque tiré du premier livre des Odes d'Horace dont je cite les mots:

«On nous demande. Si jamais, vide, sous l'ombre, j'ai joué avec toi (la lyre)…»

La pensée de M. LORENZ a donc une respectabilité bimillennaire.

Comme organe assez bien adapté au jeu, je cite le bout de la queue d'une chatte qui sert de jouet à ses petits. Je crois que le jeu tombe sous la généralisation que j'ai déjà émise, de l'excrétion d'entropie négative, mais je n'y insiste pas.

K. LORENZ. — Ich finde es ein sehr schönes, ja poetisches Gleichnis, das exploratorische Lernen junger Tiere von dem eben besprochenen «Neugiertypus i als die «Pointe de croissance», also als die Vegetationsspitze des wachsenden Verhaltens zu bezeichnen.

Die Explorationsflüge junger Bienen können vielleicht als einfachster Grenzfall eines solchen «Spieles» aufgefasst werden.

Dass das Spiel, wie schon gesagt wurde, tatsächlich eine eigene, unabhängige Quelle der Motivation besitzt, geht übrigens auch aus einer Tatsache hervor, die ich in meinem Vortrag zu erwähnen vergessen habe: sehr viele Bewegungsweisen, die im Ernstfall schon nach ein— oder zweimaliger Ausführung völlig erschöpft sind, können sich im Spiel geradezu unbegrenzt oft wiederholen.

M. MORRIS. — Professor Lorenz has pointed out that in «play bouts» an animal may perform, in quick succession, the motor patterns of several types of behaviour. BROWNLEE, in a recent paper, has described similar behaviour in domestic cattle. BROWNLEE has used these observations in postulating a play drive or instinct. In the past, play has often been thought of simply as an «immature» expression of a behaviour pattern. LORENZ has pointed out that there is no relation between the intensity of play responses and the intensity of the particular motivation involved, as there is, of course, in the «serious» non-play response. From this it might be concluded that the immaturity of play is principally due to the undeveloped state of the integration of motor pattern with motivation. But BROWNLEE saw that there was more to play than that and postulated a play instinct. I cannot quite agree with him.
however, and I think it is more probable that play is not a mechanism, but a switching off of a mechanism for the following reason: it is an ethological cliché that there is «mutual inhibition of drives at high intensities». Also we know that at lower intensities there may be ambivalent behaviour. GAITON has recently developed such ideas in his interaction theory (which will shortly be published) and, although I do not know if he will agree with me, I see in his ideas an explanation of play. I suggest that when an animal has all its «needs» satisfied — as occurs in a young animal whose parents are taking care of its problems of feeding, protection etc... also often in domestic or captive adult animals whose owners are doing likewise — the mechanisms of mutual inhibitions and sequential ordering mechanisms are not switched on and as a result there is no control over the types and sequences of motor patterns in the usual sense, and the physical vigour of the animal finds an outlet in apparently functionless activities. The excess of this vigour in the above cases may result in the performance of activities at high intensities without the interference of the usual controls which operate at such intensities.

K. LORENZ. — I think that this theory of play is rather tempting but there are certain arguments against it. One is the extremely high intensity of the instinctive movements that you see in play. In the Cat you see movements which, in actual fighting, would appear at the very pitch of fighting excitation. Yet, the next moment the animal shows that such a specific excitation is entirely lacking. Else, it could not proceed at once to perform hunting activities or to assume a defensive attitude. If the Cat really were in the state of fighting excitement corresponding to its movements it would take at least an hour or so to calm down sufficiently to find any interest in hunting. Moreover, there are certain points in highly differentiated play which are not explained by this theory. For instance, the very interesting fact that in the higher Carnivores the social inhibitions preventing the animals from real biting are not at all diminished even in the most intensive fighting play. The same holds true for the use of claws in the Felines.

Die Tatsache, dass die gegenseitige Inhibition zweier Instinkte bei niedrigen Intensitäten noch nicht bemerkbar ist, sodass Bewegungsweisen, die verschiedenen Funktionskreisen angehören, alternierend oder in wirrem Durcheinander auftreten können, darf bei der Betrachtung derselben Erscheinung im Spiel höherer Tiere sicherlich nicht vergessen werden. Ich glaube indessen nicht, dass sie allein hinreichend zur Erklärung, und zwar deshalb nicht, weil wir im Spiel sehr häufig Bewegungsweisen sehen, die eine sehr hohe Schwellenaktivitätsspezifischer Erregung haben und, im Ernstfall, erst bei Erregungsintensitäten ausgelöst werden, bei denen die gegenseitige Inhibition der Instinkte bereits voll in Kraft ist.

Ausserdem hat das Spiel ja noch verschiedene andere besondere Differenzierungen, ich erinnere vor allem an das Erhaltenbleiben aller sozialer Hemmungen, die selbst bei ansonsten intensiven Kampfspielen junger Raubtiere, z. B. Hunden, ein wirkliches Zubeissen verhindern.


Mrs SPURWAY-HALDANE. — This consists of heterogeneous points.

1° Concerning the intensity of play movements: our deaf white Cat while holding her kittens in her arms used to kick them with her hind feet so that they screamed, struggled free, ran and hid from her. They were certainly hurt and frightened.

2° Children play strikingly less in some cultures than in our own. This is correlated with economic conditions but not completely so. Perhaps something provided by play for e.g. the Mongol people of the Eastern Himalayas and ourselves is to be sought in religious practices for the Bengalis. Comparison of these cultural differences might throw light on the causation of play in non-human species.

3° Play in domestic Cats has become modified, perhaps culturally, perhaps ecotypically. The Dog-Cat relationship and Cats' play with a Mouse can be compared both with athletics and with the cult of nudes (which can be regarded as playing with the human male sexual drive).

4° To add to Dr. HEDIGER'S survey of play in the Vertebrates, I have seen two male _Rana esculenta_ during their second spring, leave the water, squat facing each other, and embrace each other's thoraces with what I interpreted to be the arm movements appropriate to amplexus. There was no attempt to achieve the amplexus position, and both were equally active. They croaked continually, expanding their throats like a _R. temporaria_. This noisy wrestling continued for several hours most evenings for several months, and became rarer at the same period as the lateral croak sacs became extruded with increasing frequency. I do not call this play, and the two animals did not move in any way harmoniously — their struggling seemed unritualized. I have never seen an activity describable as play in a Urodele.
K. LORENZ. — I don't think I have an answer to the ethnological points Mrs. HALDANE raised. I am very surprised that there are any cultures in which children do not play and I, well, I confess I am slightly doubtful about it, whether they really do not have some sort of play. But I think that the observations of *Rana esculenta*, which you did not call play, may of course be relevant: it might be something comparable to vestigial instinctive activities which make their reappearance in play only, the way AHLQUIST described in *Stercorarius*. 