The International Society for Ecological Psychology

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JOURNAL NEWS

The ISEP's journal of ecological psychology is now in business—thanks to further assistance from Lawrence Erlbaum Associates and a grant of $5000 from Trinity College. Publication begins January, 1989.

The journal does not have an official name but if you like to bet, put your money on *Ecological Psychology*—and a colon followed by a subtitle. A variety of names were suggested in a poll I took a few years ago, but no others were as descriptive, short, and widely endorsed. Nevertheless, the name is not definite and further suggestions (especially for the subtitle) are welcome. Send them (together with rationales) to me (Bill Mace) as soon as possible.

The ISEP Board of Directors will meet in Trieste to begin discussing necessary details. Very little is cast in bronze yet so now is the time to "get in your two cents worth", as the U.S. phrase goes. This much is definite: 1. The journal will be quarterly. 2. It will have no more than 96 pages per issue. 3. Individual subscriptions for ISEP members cost $20 (U.S.). That price is *included* in the initial dues. Therefore members have *already paid* for the first year's subscription. 4. There will be *no additional charge* for mailing the journal outside of the U.S. to members.

ISEP ANNUAL MEETING

Let me remind "old" members and inform new members that the ISEP Annual Meeting was set by vote of the membership for the third Saturday in October each year. This year's meeting, then, falls on October 18 and will be held at Trinity College, Hartford, CT. Program ideas should be brought to the attention of Claudia Carello (c/o Dept. of Psychology, U. of Connecticut, Storrs, CT 06268). Don't forget the **Poster Session**. This is a fine way to present your research.

Election

The terms of Board members Carello, Jones, Kennedy, Mace, Michaels, Shaw, Todd and Warren expire this year. Thus they must be re-elected or others elected in their place. Bill Warren (Dept. of Psychology, Hunter Labs, Brown University, Providence, RI 02912) is in charge of the elections. It is helpful to know who is willing to run for a position on the Board. If you wish to be "available", tell Bill.

NOTICE OF MEETINGS

Early American Functionalism and Modern Psychology. Franklin & Marshall College has organized a 3 day conference (September 10-12) pertinent to ISEP interests. The tentative program includes papers by ISEP members Steve Wilcox, Jerry Balzano, Bob Becklen, Roger Thompson and Herschel Leibowitz, and a "wine tasting with [members] Jack Heller and Mark Wagner." For more information write Fred Owens, Whitely Psychology Laboratories, Franklin & Marshall College, P.O. Box 3003, Lancaster, PA 17604. Or telephone 717 291-4202.

British ISEP. Arthur Still is again organizing an ISEP meeting in Britain. This year's is September 26 at the University of Durham and the major topic will be on the concept of *information*. One of the four planned talks will be by Jonathan Westphal of Oxford on Leibniz' anticipations of ecological psychology.

ATLANTA MEETING
May 22-23, 1987

The Atlanta abstracts give us enough material for two newsletters. Therefore the set concerning development and evolution will appear in the next one. Much of what Eleanor Gibson presented will be in a special issue of *The Journal of Experimental Psychology: Human Perception and Performance.* Look for her remarks there.

Perception of Smoothly Curved Surfaces

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The egocentric structure of an observed surface can be described at several different levels of precision. At one scale of analysis, it is possible to describe the metric structure of a surface, in which each visible region has a specific distance from the point of observation (e.g., 3.1 eye heights). There are other types of description, however, which are metrically less precise, yet are still powerful enough to capture the overall layout or topology of a surface. Suppose, for example, that the available information about a surface is restricted to ordinal relations of egocentric distance within small local neighborhoods. This type of ordinal information is powerful enough to specify the various regions of concavity and convexity on the surface, but it is not powerful enough to specify the precise metric distance between any pair of points.

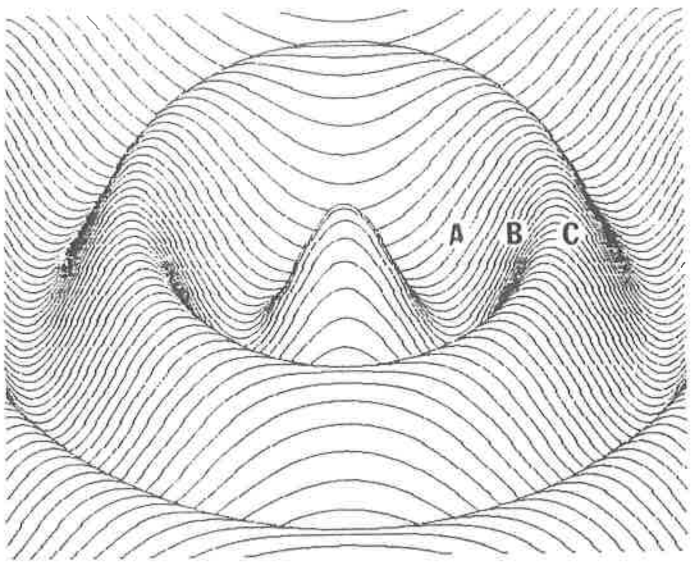

Figure 1

Recently, we have begun to suspect that the visual information provided by shaded photographs may be locally ordinal in the manner described above. In an effort to provide some empirical support for this hypothesis, a reaction time task was employed in which observers viewed computer generated shaded images of smoothly curved surfaces and were asked to judge which of two designated points was closest to the point of observation. Using metric information, this type of judgement should be easy to perform for any pair of designated points, provided that their egocentric distances are discriminably different. Using ordinal information, on the other hand, the relative egocentric distances of two disparate points, P_1 and P_n, can only be determined when all intervening points satisfy the principle of transitivity (i.e. if $P_1 > P_2 > P_3 \ldots > P_n$, then $P_1 > P_n$). For any pair of points, P_1 and P_n, that are not transitively connected (i.e. $P_1 > P_2 > P_3 \ldots < P_n$), ordinal information would not be sufficient to determine their relative depths.

Figure 1 depicts one of the surfaces used in our experiment. Although the surface in this example is defined by contours to facilitate reproduction, it is important to keep in mind that the actual displays employed in our experiments were depictions of surfaces defined by shading. The points labeled A and B in this figure are transitively connected. That is to say, as we traverse a path from A to B, each successive point is closer to the observer than its preceding neighbor. We refer to such points as "ordinal" pairs because their relative depths can be judged solely on the basis of ordinal information. Note, however, that this transitive chain is broken as we traverse a path from B to C. Points such as these are termed "metric" pairs because their relative depths can only be determined using some sort of metric information about absolute distances.

Seven observers made relative depth judgements for randomly presented pairs of points such as those depicted in Figure 1. Half of the designated point pairs were "ordinal" like points A and B in the figure, and half were "metric" like points B and C. All of the pairs were completely matched in terms of depth difference and distance apart on the display screen. Each subject ran two blocks of 144 trials.

The depth judgement data were analyzed in terms of both accuracy and reaction time. The results revealed that judgements for metric pairs were correct in 87.5% of the trials. This high level of performance suggests that, contrary to our initial thinking, metric information is available in these displays, and can be used fairly effectively in making relative depth judgements. Ordinal pairs were judged even more reliably, however, with subjects responding correctly on 97.5% of the trials. In addition to this increase in reliability, there was also a dramatic decrease in reaction time. Depth judgements for ordinal pairs took an average of .76 seconds, while judgements for metric pairs took 58% longer with an average response time of 1.2 seconds per trial. The substantially shorter reaction time with increased accuracy for judgements of ordinal pairs strongly suggests that ordinal information is indeed available in shaded displays of curved surfaces and that human observers are able to utilize this information in the perception of 3-dimensional form.

Body-Scaled Information About Affordances For Sitting and Stair Climbing

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In order to perform commonplace actions, such as sitting and climbing, actors must obtain information about environmental properties (e.g., surface height) with reference to their specific requirements for performing the act. It is essential that they recognize the critical (maximum) surface height that establishes the limit on their ability to perform a particular action. These critical boundaries constitute phase transitions between styles of action. Previous work on sitting and climbing has shown that people's judgments of action capabilities are in close agreement with their actual capabilities (e.g., Mark & Vogele, 1987; Warren, 1984; Warren & Whang, 1987). Moreover, across a wide range of individuals, these critical action boundaries can be expressed as an constant proportion of a relevant body dimension, namely leg length.

How do actors obtain this requisite body-scaled information about surface height? From a *cognitive rescaling* perspective, surface height is apprehended initially in terms of some unit that is extrinsic to the body scale of the perceiver qua actor. Perceivers then have to "rescale" that height in terms of their body size. Alternately, the *ecological realist* observes that there exists "body-scaled" information about surface height, that is, information that is already scaled with reference to the perceiver's eyeheight (e.g., Sedgwick, 1973). Each critical boundary is a specific proportion of the perceiver's eyeheight. If actors can use this information, cognitive computations are rendered unnecessary.

The current study of bipedal climbing and sitting (see Mark, 1987) examines two predictions derived from the ecological perspective: If a person's lower leg length is increased, say by standing on 10 cm high blocks, critical *seat* height will increase by the height of the block, since lower leg length contributes directly to that boundary; on the other hand, the critical *riser* height is unaffected, since that boundary depends only on the person's upper leg length (Warren, 1984). However, for both acts, eyeheight increases by the height of the block. If people use available eyeheight-scaled information about surface height, then they should underestimate their critical seat height (eyeheight has changed by 10 cm, but only a proportion of that change is involved in the surface height to eyeheight proportion) and overestimate their critical riser height (eyeheight has changed, but critical stair height is unchanged).

Both predictions from the stance of ecological realism did obtain. Moreover, the same study showed that the cognitive rescaling approach would have serious difficulties in accounting for these data. All participants consistently overestimated the height of the block. From a rescaling perspective it has to be puzzling that observers' estimates of their critical action boundaries were more accurate than their judgments of the block height, which must enter into any requisite rescaling operation to determine the critical action boundary. At the very least, this pattern of results is consistent with the ecological proposal, that observers use existing eyeheight-scaled information about surface height.

Another finding poses a significant challenge for both the ecological and cognitive rescaling perspectives. Observers made 12 judgments of either maximum seat or riser height while wearing blocks and 12 judgments without the blocks. Estimates of the critical action boundary without the blocks were fairly stable throughout the course of the experiment. However, judgments made while wearing the blocks changed throughout the experiment to reflect the actor's new capabilities. This change occurred over a period of roughly 30 minutes and in the absence of any opportunity to practice the relevant act. Future work must focus on the process through which critical action boundaries are retuned in accordance with changes in the actor's capabilities.

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Transformational Invariants in Event and Motion Perception

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Three issues about invariance and perception raised by Jim Cutting (1983, 1986) were discussed. The general theme was that his remarks have some force with respect to problems in classic motion perception but not with respect to event perception.

Issue One. Cutting holds that since transformations are about change and invariance is about nonchange, the concept of transformational invariance is an oxymoron. I argue that, since in motion perception one selects a *motion* (i.e., a transformation in the environment) for study, there is no issue of whether or not the environmental change is the same for different objects. For example, if you study the perception of rotating objects, all the objects are engaged in the same motion– rotation. In event perception one selects an *event* to study. The pattern or patterns of change that occur in the environment are not known as a consequence of that act of selection. In particular, one doesn't know whether or not there is a single transformation undergone by every object that participates in the event. That is, we don't know if a tranformational invariant (TI) exists in the environment for the event. For example, if you are studying perception of human cranio-facial growth, you do not know, a priori, whether or not all normally growing human faces change their sizes and shapes in the same way. The claim that TI's exist for events constitutes a strong empirical hypothesis about the nature of events: Namely there is, in the environment, a real sameness in all instances of a given event.

If you wish to think of invariance only in terms of invariance under transformation, the notion of transformational invariance is, at the least, quite odd. For example, to say that cardiodal strain is the environmental TI for normal human facial growth is to claim that every normally growing face undergoes the same pattern of shape change. If invariance has meaning only under transformation, you must then say under what transformation the TI is invariant. In the growth example, this transformation would be one that turns one person's face into the faces of other people. Such a transformation is surely odd. This result could make us question the meaningfulness of the concept of TI. However, I would suggest that this conception of invariance, while purporting to adhere strictly to mathematical conventions, is narrower than the conception actually used in mathematics and physics. In addition, no matter how one cares to define mathematical terms, any account of perception of change must include a specification of the pattern or patterns of change in the environment. In particular, while the term "TI" might be seen as ill-chosen, the idea to which it refers is at least a potentially true empirical claim.

Issue Two. Cutting has argued that invariants are information, not object properties, and that one must not confuse that which is to be explained with the basis for its explanation. While Shaw and I intended the TI notion to apply both to patterns of change in the environment and in the optic array, our own empirical work, e.g., facial growth, has involved TI's in the environment. Have we thereby fallen into confusion?

Again consider the difference between motion and event perception. In motion perception it is surely true that the invariant flatness of a plane does not explain perception of its flatness. Also, the fact that an object is rigidly rotating does not tell how we perceive the rotation. Explanations would be based on specific patterns of change in the optic array that correspond to flatness and rotation in the environment. These examples from motion perception make specification of environmental TI's seem trivial and suggest that we have confused what is to be explained with the explanation. I argue that this specification is a crucial part of the work needed to be done in explaining perception of events. First, in order to perform the optic array analysis, one must discover the pattern or patterns of change in the environment that are characteristic of the event. Second, there is perceptual research to be done on the basis the results of a TI analysis in the environment. Displays generated by application of the environmental TI can be presented for studies of event and object identification. Observation of failures to perceive the predicted event or object would show that the event has not yet been specified in a perceptually relevant way.

On the other hand, without the optic array analysis, explanation is incomplete. How serious a failure this is, for the events studied to date, not entirely clear. Note that feature analyses, such as those for printed letters and for reading X-rays, also do pattern specification only in the environment. Also, note that there is, in our stress on environmental TI's, the implication that those patterns carry information for the identity of the event. The exact sense of "information" here and its relation to information in the optic array remains to be clarified.

Issue Three. In his discussion of the TI concept, Cutting argues that objects do not operate on transformations so as to change them. While this is correct, the example he gives (about a push to the left not becoming a push to the right due to the nature of the object being pushed) misses some points important to understanding event perception. I would argue that in motion perception, but not event perception, one can ignore the properties of the object as well as the object's environmental context and the applied forces. In motion perception, when the motion to study has been selected, it is as if these three factors have already been "taken into account" with the result that the particular motion in question has been produced.

In event perception, however, one can be concerned with how the object, context and forces work together to produce the event (and the resulting patterns of change in both the environment and optic array). In search for the environmental patterns characteristic of the event, any theorist might find the physical analysis of the event useful in suggesting patterns of change to consider. Direct theorists will certainly want to do such analysis so as to have the first stage of an explanation of for explaining how force can be perceived and why perceptions of force, object identity and event identity covary.

Cutting has developed one of the few general positions on the use of the concept of invariance in perceptual theorizing. While I disagree with much he says, his analysis challenges theorists to further clarify and extend invariance concepts.

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"Mechanisms" of Dynamic Pattern Generation in Perception–Action Systems

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In general, the movements of living things require the cooperation among many components and can thus be said to exhibit the property of *coordination*. From a theoretical point of view, such coordination of multiple degrees of freedom can be considered an instance of pattern formation by the biological system. In particular, if characterized with respect to their temporal order, these patterns are very similar in different movement systems and thus seem open to more general theoretical study. Such patterns may be considered "intrinsic", in the sense that they need not be imposed on the system from the environment, but occur spontaneously during many functional behaviors.

In order to explain the underlying basis of pattern generation, a prominent scientific strategy is to decompose and analyze the material substrate (e.g., neurons and their connectivity). On the other hand, in the interdisciplinary field of synergetics (Haken, 1983), it has been shown that dynamic patterns in open physical, chemical and biological systems emerge spontaneously from the cooperation among the system's components in a so-called self-organized fashion. Although the components of such systems are materially very different, the principles underlying their collective behavior that produces spatial, temporal or functional patterns may be the same.

In biology and psychology, the path from the microcomponents (at whatever scale of observation) to macroscopic pattern is not transparent. However, in a number of cases that involve primarily rhythmic movements, some understanding of coordinated movement patterns has been obtained using what we call a "synergetic" strategy. The main features of this strategy, which requires an intimate link between experiment and theory, are (Kelso, Schöner, Scholz & Haken, 1987): 1) identifying collective variables (order parameters) that characterize movement patterns; 2) mapping the observed stable patterns onto attractors of the collective variable; 3) determining the dynamics of the collective variable; 4) studying stability and loss of stability of the patterns; 5) deriving collective variable dynamics from component behavior, i.e., linking levels of observation in a rigorous fashion.

Using this strategy a number of existing results on coordination of multi-degree of freedom movements has been explained, new phenomena predicted and subjected to experimental test (for review see Kelso & Schöner, 1987). In particular, in studies of human hand movements, phase transitions have been discovered. In these experiments subjects were instructed to move in one of two patterns with a frequency given by a single metronome (or, in other experiments, the movements were self-paced). During each trial the oscillation frequency was then increased in steps. If the system was initially prepared in the anti-phase coordinative pattern, a spontaneous switch to the in-phase pattern occurred at a certain critical frequency. No switching occurred if the system was initially prepared in the in-phase pattern. In detailed experimental and theoretical work it was shown: that the movement patterns could be characterized by the collective variable, *relative phase*, which thus served as an order parameter in the sense of synergetics; that the two stable patterns could be modelled as point attractors (relaxational dynamics) for the collective variable; that stability and stationarity of the patterns could be measured and interpreted in terms of the stochastic dynamics of relative phase with certain time scales relations; that the switching of patterns was due to loss of stability of the attractor for anti-phase motion (a non-equilibrium phase transition); that the dynamics of the switching process itself were well characterized by the stochastic dynamics of relative phase; and, that the collective variable's dynamics could be derived from a nonlinear coupling among the hands modelled as nonlinear oscillators. The foregoing steps have been implemented analytically and computationally.

Because the dynamics of certain intrinsic patterns are quite well understood, a principled approach to related problems, e.g. the perception- action relation, learning and pattern recognition is possible. In particular, we show how one can extend the synergetic strategy to cases in which a (temporally) structured environment modifies patterns of hand coordination. The basic idea is to treat the environment as forces acting on the dynamics of the collective variable, relative phase, simultaneously with the intrinsic dynamics in which no structured environment is present. These forces can either *cooperate* or *compete* to produce the resulting behavioral pattern. For example, when the required relative phase coincides with one of the basic intrinsic patterns (in-phase and anti-phase), the systematic deviation between required and actually produced relative phase is small and variability is low. However, when the required and actually produced relative phases conflict, much less accurate and more variable performance results. Thus, once again it is possible to link the theoretical concept of stability to actual empirical observations of environmentally specified movement patterns. Significantly, both environmentally and internally evoked cooperative states can be derived from the component level of description. It is important to emphasize again the fundamentally *abstract* nature of the collective variables and the purely *functional* (not hard-wired) coupling among the oscillators that gives rise to these cooperative states. The present approach provides a rich methodology that can now be fully exploited experimentally. Applications emerging from the research could be quite concrete: Low dimensional, task-specific dynamics for instance, could provide a control structure for a robot, where the number of degrees of freedom is often considered problematical. The idea of mapping the behavior of dissipative, multicomponent systems onto attractors offers a novel computational approach to biological complexity. The principle of self-organization of patterns in which functions are achieved in both a flexible and stable manner may also be relevant to engineering. Engineers often seek flexibility, but at the same time do not want to give up stability. The present approach allows them to have their cake and eat it too.

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Transitions in Patterns of Bimanual Coordination: Test of a Dynamical Model

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When human subjects attempt to increase their frequency of movement while their hands or fingers are being coordinated in an out-of-phase pattern, a natural transition to an in-phase pattern of coordination occurs at a critical movement frequency. This bimanual transition, similar to gait transitions in quadrupedal locomotion, has been modeled successfully as a nonequilibrium phase transition by Kelso and colleagues (e.g., Schöner, Haken & Kelso, *Biol. Cybern.*, 1986). According to their treatment, the switch from an out-of-phase to an in-phase pattern occurs secondary to the loss of stability of the former state. Their minimal stochastic model leads to certain predictions about the system's behavior as the transition is approached which were tested in the experiments reported herein: critical fluctuations (CF) and critical slowing down (CSD). In addition, analytic solutions to the model equations based upon parameter estimates from pre-transition movement frequencies provided an estimate of how long it should take for the system to switch states (i.e., switching time), which was also evaluated experimentally.

In the two sets of experiments reported, subjects either abducted and adducted (exp. 1) or flexed and extended (exp. 2) both index fingers in synchrony with a metronome while producing either an out-of-phase or in-phase pattern of finger coordination. Metronome frequency was increased systematically in 0.25 Hz steps. The standard deviation of the relative phase of movement between the fingers, calculated separately at each frequency, served as an estimate of fluctuations around the system's mean coordinative state. CSD was evaluated by randomly perturbing the right index finger and measuring the time taken for the system to return to its previous coordinative state (relaxation time).

In the first experiment, a significant increase in the mean sd of relative phase occurred in the out-of-phase pattern as the frequency of movement approached the critical frequency. In experiment 2, relaxation time increased significantly in the out-of-phase pattern (CSD) with increasing frequency prior to the transition. Both SD and relaxation time decreased after the transition to the in-phase pattern, and both remained constant or, in some cases, actually decreased across frequency when beginning in-phase. This behavior was entirely consistent with the stochastic model. Additionally, both the mean and distribution of experimental switching times were remarkably similar to those estimated from the model.

Thus, the model and results of the experiments are self-consistent, suggesting that switching among patterns of bimanual coordination can be understood as nonequilibrium phase transitions of the type studied in many physical systems in nature.

Smart Perceptual Mechanisms: Hefting for a Maximum Distance Throw

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Psychophysicists have assumed that the *weight* of an object hefted in one hand is an appropriate perceptual property for study without regard to a specific functional context in which the perception occurs. The long standing result—perceived weight decreases with increasing size (volume) of a hefted object—has been called the "size-weight illusion." With this observation, weight is added to a long list of misperceived properties. But is this an appropriate conclusion, ignoring as it does the functional context in which weight-related properties are ordinarily perceived?

We have performed an experiment using typical "size-weight illusion" objects, namely, different sized styrofoam balls packed symmetrically with varying amounts of lead shot and clay. For each of four different diameters, there were eight objects varying in weight. Participants were asked to choose (by hefting) that object within each size that they could throw the farthest distance. Strong and reproducible preferences were exhibited consistently across participants. Subsequently, it was found (with appropriate experimental controls) that preferred objects were those that were thrown the farthest and that distance of throw generally varied with order of preference, proving that preferred objects correspond to optimal objects for throwing to a maximum distance.

The key aspect of the result is that preferences reflected the typical size-weight illusion pattern: As the objects increased in size, heavier objects were preferred. The power law relating volumes to mean preferred weights was $Weight = 4.82\ (Volume)^{.42}$. This is comparable to a power law relating weights judged of equal apparent heaviness across increasing volumes. Using data from Cross and Rotkin (1975), a power law was computed for weights and volumes within the range of values used in our hefting experiment. The result was $Weight = 4.08\ (Volume)^{.40}$. The similarity in values for exponent and proportionality constants shows that the scaling relation between volume and weight is essentially the same in both cases. However, in the context of throwing, this result is characterized not as the misperception of a property (e.g. weight) selected from the dictionary, but as the *successful detection of a functionally constrained property* of the objects as reflected in the scaling relation between size and weight.

There is a crucial advantage in a functionally constrained approach to this problem. Describing the scaling relation between size and weight as an illusion provides little or no guidance for further investigation of the factors generating the relation. In contrast, studying the relation in the context of maximum distance throwing leads naturally to the next research question. How does the act of throwing to a maximum distance constrain the size and weight of optimal projectiles?

There are (at least) three alternative strategies for attacking this problem. The first is to use scaling techniques together with object mass, size, and distance data and the well known equations describing terrestrial projectile motion to develop a description of the scaling between object characteristics and release velocity. This scaling reflects the manner in which thrower characteristics in the act of throwing interact with object characteristics to determine throwing distance. The second alternative is to study directly the kinematics and dynamics of throwing with objects of different size and weight. The complexity of throwing make this a hefty methodological challenge. We deferred this approach in favor of the third alternative which is to study the kinematics and dynamics of hefting.

Long distance throwing poses a problem for an organism which must accelerate a projectile over a limited range of limb motion using actuators with limited gain. Throwing is commonly organized so as to overcome these limitations. Kinetic energy of a projectile at release together with angle of release determines flight distance. Two strategies are used to maximize the energy transferred to the projectile at release. First, kinetic energy is developed in the more massful trunk and proximal limb segments and passed successively along distal segments eventually to the projectile. Second, energy is stored in the tendons through the wrist and is unleashed in the last 50 msec before release, (Atwater, 1979; Jöris, Muyes, Schenau, and Kemper, 1985). This organization comprises what has been called, alternatively, a coordinative structure, a synergy, or a smart device. The smartness inheres in taking advantage of particular circumstances in the organization of the activity to achieve a specific goal.

Runeson (1977) has hypothesized that perceptual systems are composed of a collection of smart devices. Many of the characteristics of hefting mirror those of an overhand throw. For instance, a reversal in the direction of motion of the forearm creating a snapping motion at the wrist occurs in both cases. Given the fairly obvious smartness exhibited in the organization of throwing and the similarity between throwing and hefting, we concluded that hefting provides a nice opportunity to study a smart perceptual mechanism.

In experiments 3 and 4, the kinematics of hefting were recorded and analyzed both in search of kinematic properties comprising information for optimal throwability and in search of corresponding evidence for optimality in terms of dynamic properties *of the smart device.* The primary effect of increasing the diameter of spherical projectiles is to change, through the grasp, the effective length of the extrinsic tendons through the wrist to the fingers, (Armstrong and Chaffin, 1978). These tendons participate in wrist flexion and thus, changes in stiffness, damping, and relative distances of maximum extension at the wrist might be expected to accompany increases in object size. In experiment 3, we investigated these hypotheses which were confirmed by the results.

The majority of the power in a throw is developed in an extremely brief period of time (i.e. 50 msec). Such organization requires skilled and stereotypically precise interarticulator coordinative timing. The effects of increasing object size discovered in experiment 3 are bound to affect coordinative timing. Experiment 4 investigated changes in the phasing of motions at the joints and the effects on the kinetic energies generated. Results showed that the phasing of elbow peak velocity remained invariant in hefting with optimal objects whereas parallel changes in phasing occurred over different sizes of objects that were lighter or heavier than the optimum. This phase result correlated with an optimal relation among terms of the kinetic energy equation for optimal objects.

Long standing methodology for the study of perceptual properties contains a myth. The myth is that perceivers have special access to knowledge of the types of events and event properties that are apprehended. Historically, philosophers and psychologists have acted as if human language capabilities constituted a solution to questions about the categories of human experience. They have assumed an isomorphic mapping between words and perceptual properties. The myth is exploded by asking people exactly what they are doing when they catch a flyball or when they raise their arm. As with walking or batting a ball, language use is a human activity; it is a problem for scientific understanding, not a solution. The mapping between language and perceptual properties is unknown. Describing this relation requires that we develop on independent understanding of perceptual properties. In this study of hefting and throwing, we have discovered a perceptual property, described as 'spherical object of optimal size and weight for throwing to a maximum distance', that does not map simply to a word in the language like "weight". Since the mapping between words and perceptual properties, as entailed by smart perceptual machines, is unknown, research on perceptual properties is better guided by clearly delineated functional contexts than by categories taken from the dictionary. We had best address the question, "How do we do X ?"

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POSTERS

Robin Akerstrom and James T. Todd (Brandeis University). The Perception of stereoscopic transparency.

Louis A. Boudreau and Peter V. Oliver (University of Connecticut). Communication expectancy, trait utilization, and affordances in person description.

Claudia Carello (University of Connecticut). New metrics for distance perception.

Marvin J. Dainoff and Leonard Mark (Miami University). Developing an ecological framework for the design of ergonomic furniture.

John M. Kennedy and Andrew Portal (University of Toronto). Invariants allow accurate detection of symmetry properties even in illusions.

John Jeka and J. A. S. Kelso (Center for Complex Systems, Florida Atlantic University). Some preliminary observations on pattern stability and change in multi-component coordination.

Tom Stoffregen (Computer Technologies Associates) and Gary Riccio (AAMRL/HEF, Wright Patterson AFB). An ecological paradigm for the study of motion sickness.

I.S.E.P. NEWS & WEATHER

By Jean-Paul Parisii

From around the corner and around the world, ecological topics make news. However, even the scrupulous news hound may have difficulty identifying the good news, the bad news, and the ecologically valid news. To assist you in the quest, our crack team of reporters and stringers brings you NEWS & WEATHER of ecological psychology. The particular orientation of topics, the slant of the stories (or, is it TILT?), varies from one installment to the next, but the general perspective is the familiar one.

MENTAL HEALTH CRISIS AVERTED–If you ran the National Institute of Mental Health, what kind of agenda would YOU design? Obviously, you would prefer first to improve basic research on the perceptual underpinnings of mental health. You will probably, therefore, want to preserve the present policy of scouting the horizon for public health crises that can be handled if identified early. After all, your agency should contribute to the well-being of the republic, shouldn't it?

A recent report in the *American Journal of Psychiatry* is a fine example of research fulfilling this watchdog function. Sounding the alarm, this study determined that prisoners who have been convicted of capital crimes and who are awaiting execution (Yes, the U.S. has a death penalty again) appear to suffer from previously overlooked emotional and behavioral disorders. Like what, you ask? Well, how about seizures, intermittent paralysis, blackouts, vertigo, diminished reflex vigor, Psychosis, and extreme swings in mood. According to the report, this dreadful situation had escaped notice chiefly because of the lifestyle of the inmate *before* incarceration. Unlike Kenny Rogers, who spends his days touring with Dolly, recording hit tunes, or riding the manicured range with an entourage of roadies, barbers and photographic assistants, many murderers are misfits, drifters, loners, social outcasts, pariahs, losers, or vagabonds who do not form the kind of lasting and close personal relationships that might bring a mental illness to light. Just like in *Psycho*, or *The Executioner's Song*, or *Annie Hall*.

If a society is known, deeply, by the nature of its prisons, then this report in *Am J Psychiat* suggests that things in the U. S. may be getting out of hand. Only someone with a heart of coal would fail to recognize this touching expression of concern for the mental health of those who are about to make the final payment on their debt to society. But it remains a complex matter, nonetheless, because advocating therapy to cheer up terminal inmates is a little like requiring the convict to eat a health salad for the last meal, to promote gastrointestinal (g.i.) tract fitness.

A quick solution is not in the offing, though at least this public health problem is receiving serious attention. As usual, the progress will occur in the most convenient way first, and we may expect to hear soon about the advent of a new subspecialization of clinical research and practice: Counselling the parents of emotionally disturbed children on death-row. Watch for it.

ECOLOGICAL MINIATURES–Recall those terrific studies of flea locomotion? Basically, the puzzle was to identify excitation or disinhibition as the underlying neurophysiological mechanism by which the flea gets around on the dog. As you recall, disinhibitory influence releases sufficient mechanical force that, if applied to a substrate, the flea is able to propel itself a distance over 1,000 times its own length, which is not bad considering how much effort it takes just to move the human body off a couch and into an upright posture. Anyway, as it happens, this bit of flea-ology is not quite right. New research indicates that the prodigious jumping may only occur in ecologically compromised situations, for example, when the nervous system is driven directly with electric current. Parasitologists have recently reported observations in more natural circumstances, in which fleas preferred to walk rather than to jump or even to hop.

But how did these intrepid scientists contend with the fur to get a clear look at the strolling fleas? Luckily, they were able to invent a virtual dog composed of clear plastic membranes and tubing, with some glass vessels to contain the flea food (warmed dog blood). It was no problem to view the fleas at work and play, especially since their preferred gait was not acrobatic.

Of course, the American Kennel Club acknowledges all kinds of nutty breeds of dog, but does not identify any that are transparent. On operational grounds, you might feel that the niche of the flea is hardly simulated by such a contraption. But, the fleas were evidently comfortable enough to produce offspring copiously, and you know how difficult it is to get them to mate in captivity. Even the first generation, collected from an infested hound, exhibited the pedestrian disposition. No, you can trust this finding, another victory for the ecological perspective.

REVOLTING SOCIAL ECOLOGY–So, let's say that you decide to make a little extra dough during the summer by working for a couple of months as a mercenary in Central America. The pay is great (a lot is off the books), you get to meet interesting people, and it is supposed to be a real education in the art of grantsmanship.

Well, don't be misled. Though you'll have to suffer some boring evenings on the Honduras-Nicaragua frontier, if you go on a raid into Nicaragua you may expect to enjoy yourself. No, it isn't the satisfaction of interviewing the indigenous populace, or the exhilaration you'll feel when poor farmers almost willingly share their meager stores with you and the other freedom fighters. It's the civilized pleasure of television.

It's hard to believe, but according to a recent report, the most popular show in communist Nicaragua is "Knight Rider." What about those legendary Soviet documentaries on tractors, industrial production and modernization of Uzbek villages? What about Cuban propaganda telecasts about literacy, vaccination of children and revolutionary struggle? Nobody watches them, preferring these shows instead: "Laverne & Shirley," "The Glen Campbell Show," "The Dick Van Dyke Show," "The Benny Hill Show," "Swiss Family Robinson," "Quincy, M.E.," "The Smurfs," "Porky Pig," "The Three Stooges," and "Bewitched." Obviously, these shows are aired in Nicaragua according to the Sandinista policy of subduing unruly comrades, lulling them into a drug-like compliance. Such a calculating, cynical, atheistic policy is sure to backfire, though, because mercenaries can also enjoy the entertainment on battery-powered field televisions. You can if you go there.

Though the effect of "The Glen Campbell Show" on the dupes of communist revolution can only be to convert them into brain-dead zombies, such shows must have an unintended though significant effect of maintaining high morale among the mercenaries on maneuvers. It is the stuff of dreams: Up at dawn to prevent the establishment of Soviet bases just minutes by MIG from Nieman-Marcus; then, turn in early to catch reruns of "Laverne & Shirley." Surely, these are unusual conditions of social ecology.

And it's better than teaching Intro in the summer. Your field commander won't ask difficult questions the way your students do.

MISPERCEPTION OF THE MONTH–Society member P.E.R. reports seeing someone press on his eyeball and then remark: "The world appears to move!!" After making sure that the misperceiver was not suffering from even graver delusions, he immediately admonished the disingenuous pedant to reeducate his attention. (Don't forget to send your observations of misperception to I.S.E.P. News & Weather, c/o Dr. W.M. Mace at the familiar address.)

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