Tableau II.

| Traitement | Carbamyl-phosphate synthétase | | Ornithine transcarbamylase | |
|---|---|---|---|---|
| | $\mu M$/h/g foie | $\mu M$/mg protéines | $\mu M$/h/g foie | $\mu M$/mg protéines |
| Témoins | 51,0 ± 10,0 (10) [b] | 0,503 ± 0,071 (10) [b] | 2080 ± 385 (13) [b] | 20,6 ± 3,7 (13) [b] |
| Décapités | 22,8 ± 5,0 (10) [b] | 0,226 ± 0,021 (10) [b] | 1474 ± 218 (13) [b] | 14,5 ± 2,1 (13) [b] |
| Décapités + cortisol | 91,9 ± 19,5 (7) [b] | 1,160 ± 0,245 (7) [b] | 2230 ± 612 (7) [b] | 28,1 ± 7,7 (7) [b] |
| Témoins [a] | 68,9 ± 13,4 (7) | 0,877 ± 0,166 (7) | 2934 ± 733 (7) | 37,3 ± 9,4 (7) |

[a] Foetus témoins de la même portée. Moyennes ± intervalle de confiance au niveau de probabilité: $p = 0.95$. [b] Différence significative pour $p$ 0,05. ( ) Nombre de mesures.

et où le taux de corticostérone circulante est le plus élevé[14,15]. Nos résultats montrent en effet que l'augmentation d'activité de ces enzymes qui survient à partir de 19,5 jours dépend de la présence des corticostéroïdes, ceci est en accord avec le fait bien connu que ces hormones contrôlent la maturation fonctionnelle du foie foetal[16]. Le rôle important des corticostéroïdes dans la régulation de l'activité des enzymes impliquées dans la synthèse de l'urée a déjà été mis en évidence, après la naissance et chez le rat adulte[12,17–21]. Cette activité est diminuée après surrénalectomie ou augmente après l'administration de cortisol ou de triamcinolone.

L'effet de l'apport supplémentaire de corticostéroïdes exogènes a aussi été étudié chez le foetus[22].

Aucun effet n'est observé entre 19,5 jours et la naissance probablement parce que le taux de corticostérone endogène est déjà relativement important au cours de cette période[14,15]. En fait, le foie foetal semble capable de répondre à ce stade du développement. SCHWARTZ[22] a en effet montré que les glucocorticostéroïdes peuvent augmenter l'activité du système arginine synthétase dans le foie foetal mis en culture. Nos résultats montrent d'ailleurs que l'apport de cortisol aux foetus dès l'âge de 18,5 jours permet d'augmenter l'activité de la carbamyl phosphate synthétase et de l'ornithine transcarbamylase à un niveau plus élevé que la normale. Des études sont actuellement en cours pour préciser si l'administration de glucocorticostéroïdes au foetus bien avant que les surrénales soient stimulées peut accroître prématurément l'activité enzymatique.

*Summary.* Two enzymes of the urea-cycle (carbamyl phosphate synthetase and ornithine transcarbamylase) have been studied in the liver of foetuses and newborn rats and of foetuses lacking of corticosteroids. In control foetus, simultaneous and regular increase of the both enzyme activity was observed between 17.5 days of pregnancy and birth. The lack of corticosteroid from 18.5 days of pregnancy caused a marked diminution of the enzyme activity. This activity is enhanced after administration of cortisol (hydrocortisone) to these 18.5-day-old foetuses lacking of corticosteroids.

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## COGITATIONES

## Developmental Phases in Visual Recognition of the Human Face Pattern, Exemplified by the 'Smiling Response'

This study is about developmental phases of visual recognition of the configurations of the human face, which function as 'releasers'[1] for infants' 'smiling response' (SR). This response is associated with a mechanism analogous to that of the 'innate releasing mechanism' (IRM)[2]. Thus, the study of SR can offer clues about a very early stage in the processing of visual stimuli.

The infants' SR to the human face has so far been found to be a reaction to the 'releaser'[1] stimulus consisting of the general configuration of the 'forehead-eyes-nose sector'[1]. This area, when presented as a stimulus for SR was either left unaltered or was simplified by presenting the nose as small or non-existent and the eye region by two dot-like shapes. One study had replaced the eyes by movable glass marbles behind a cut-out square card board frame[3]. This experimental set-up demonstrated that it was the 'invariable Gestalt con-

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figuration of the eye region'[3] which elicited SR. Another study used photographs of the essentially unaltered configuration of the face[4]. There was shown an age-related different 'latency' in SR to the face and to its photograph. The latter had 'a more striking contrast against the background of the face. Shadows accentuated the vertical line of the nose and the horizontal line of the eyes'[4].

The present study offers the hypothesis that the infant smiles more readily to simple patterns of the face which are specifically patterned after man's very early, e.g. 'neolithic' ways of representing the human face in art. In these, the vertical midline sector of the face is specifically altered, in a way unique in art, to form a forehead-nose continuum while obliterating the bridge of the nose (Figure, NGr and NGl) and neglecting or omitting the mouth.

The 'neolithic' face configurations were found world-wide in art up to about 4000 years ago as observed in ancient artifacts[5]. However, in the remote enclave area of the Upper Sepik River of New Guinea the author on a recent visit there collected artifacts and drawings still showing such 'neolithic' face configurations. Such a selection of stimulus patterns for the SR is based on the empirically supported view that there exists an 'evolutionary hierarchy of levels of learning and of perception and thinking'[6], and that early levels can coexist with later ones in adults or can be reactivated.

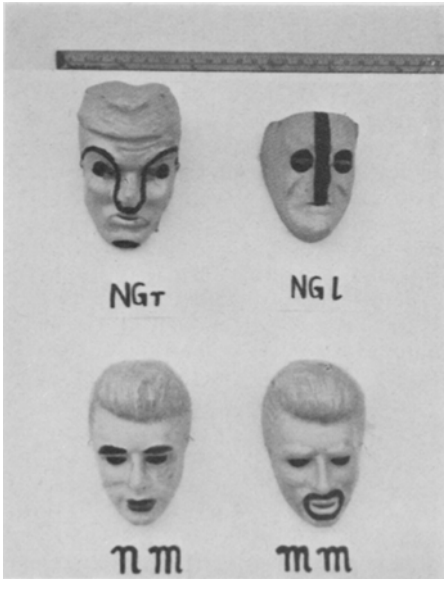
*Method.* In a cross section method, 101 randomly obtained infants (both boys and girls) from 7 to 25 weeks of age were tested. The Ss were all the infants of this age group available at 13 institutions in 7 cities of West-Germany. These institutions were mostly for infants of unwed teenage mothers of a low socio-economic level. The infants were of various ethnic groups, mostly of German mothers and of fathers many of whom were guest-workers from various European countries. No neurological or other pathology was reported in the Ss. The upper end of the age range presented itself as a necessity, since by this age there were few of the institutionalized infants not yet adopted or otherwise placed. Moreover those infants not yet placed by 25 weeks of age might no longer have represented a random sample but a negative selection for various reasons. Had the test results however revealed a high degree of preference for 'neolithic' face configurations around 25 weeks of age, then other sources for recruting Ss 25 to about 28 weeks of age would have had to be tapped, though not older ones, since by 7 or 8 months of life it is the *individual's* facial features which elicit SR.

All testing was done indoors by daylight while the Ss were lying on their back in their crib after feeding. Clinical observations suggest that the Ss were on the arousal level called 'alert activity'[7]. Only purely visual stimuli were presented. These were 5 face configurations (Figure): 4 full-face male masks, which were specifically altered and put on E's head. E's natural face was used as a 5th stimulus.

All stimuli were presented en face with 2 per sec nodding motions ranging ca. 20 to 30 cm from the Ss' faces. To avoid an order effect, 2 sequences of stimuli were presented, alternating between the natural face or natural mask and masks with various accentuations of features. Thus, one S was given sequence A, the next S sequence B. Sequence A was: 1. natural face, 2. NGr, 3. nm, 4. NGl, 5. mm. Sequence B was: 1. NGr, 2. natural face, 3. NGl, 4. nm, 5. mm. These two sequences alternate between the natural face or the mask resembling it on one hand and on the other hand the 'neolithic' type masks, which in turn were presented in alternation between the roundish (NGr) and the longish (NGl) types. The 5th stimulus, the mask with the accentuated mouth (mm), having no partner, was presented at the end of each sequence. Thus mask 'mm' followed once a 'neolithic' type mask and the next time a 'normal' type of face stimulus.

A visual preference method was used to measure the fastest reaction time of Ss following presentation of the stimuli. In order to rule out chance results, the stimulus sequence was presented twice to each S. If any difference occurred, the same sequence was presented a third time to clarify the preference. A third presentation was only necessary in very few cases.

Measuring by stop-watch was begun as soon as the S had oriented his head and eyes toward the stimulus and had fixated it. The presentation varied from 1 sec to 3 min, depending upon the onset of the infant's full, open mouth SR. After 3 min, the presentation of the particular stimulus was discontinued. If there was never any smiling within 3 min, these Ss were eliminated from the sample. Only the fastest full, wide open mouth SR was counted in an all or none measurement. To avoid habituation and experiment-induced heightened arousal, an intertrial interval of ca. 2 min was used. If Ss became desinterested, testing was halted and resumed when S was again in an alert state.




Stimuli. NGr: 'neolithic' type mask with sinusoidal outlines of the mid-forehead-nose continuum, the bridge of the nose being as wide as the tip of the nose. The mouth is small and deep-set. NGl: 'neolithic' type mask with long vertical midline, beginning above the eye level. The mouth is neglected. nm: 'natural', unaltered mask. mm: mask with mouth outlined. (E's natural face, female, brown hair, without make-up was also presented as a stimulus).

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*Results* are summarized in the Table. The hypothesis was confirmed only in the young age groups (7 to 18 weeks): There was a highly significant preferential reaction to the presentation of facial configurations, representing the 'neolithic' patterns (NGr and NGl).

By contrast, the reaction of the oldest age group was the opposite to that of the younger groups.

None of the Ss in any age group gave any preferential SR to the mask with the outlined mouth (mm) nor to the mask with an unaltered 'natural' face (nm). Since, however, the mask 'mm' was always presented last, the consistent lack of its preferential choice over other stimuli may not be given as much weight as that same lack of preference for the natural face, which was presented in first or third place. Thus, at 7 to 18 weeks of age the preference for 'neolithic' types of face configurations over the natural face is the most significant finding. Ideally, 5 different sequences should have been presented in which each stimulus would have been in turn the first one of the sequence. It was, however, noticed that the order of presentation made no significant difference in the results with respect to the 2 stimuli which were each presented first in turn within the 2 sequences used, e.g. the natural face was never preferred at 7 to 18 weeks of age.

*Discussion.* The present study identified a new class of specific and simple face configurations which facilitates visual recognition of the stimulus in an early phase of the SR. A 2nd member of this new class exists in an early phase of man's representational art, called 'neolithic'. A 3rd member of this class exists in the neurological regression or reactivation of early modes of visual processing: in prosopagnosia. In it the human face exclusively is experienced as distorted in a specific way which is strikingly analogous to the configurational patterns of the face which elicited the SR preferentially in the young Ss.

There appear to be at least 1, if not 2, common denominators among these 3 members: 1. a functioning at a less differentiated degree of visual processing, thus facilitating visual perception in general; and 2. a facilitating effect on perception triggered by specific face configurations which were associated at an early age with IRM. Could one or even both of these facilitating factors be operative during developmentally 'early' phases as well as under pathologically regressive conditions?

Despite the general critical discussion in the literature about the existence of prosopagnosia as a separate entity, its occurence in a 'pure' form has been recently held to be 'theoretically possible'[8], even though rarely. This impairment of visual recognition of the human face exclusively 'may be *partial* and subtle, being more for *certain* configurations (of the face!) and less for others'[8] (italics added). Such a selectivity in the impairment of face recognition appears to be related to the presence or absence of the functioning of an early mechanism of recognizing the face configuration as shown in the present study.

Considering developmentally early behavior, it is especially the following findings of previous studies[3] which appear in a newly significant light in the context of the experimental results here presented: When the eyes as stimuli for the elicitation of SR were represented by movable glass marbles[3] on a cut out card board, the infants between 2 and 4 months of age, who seemed to gaze into the adult's eyes, actually gazed at the area in the *middle between the eyes*, so that their gaze was seen scanning in the region of the *bridge of the nose*. It was also found in the same study[3] that infants at the end of the 3rd and especially during the 4th month of life looked at only *one* of the two simulated 'eyes' at a time, even if the 2 glass marbles were placed at a distance only half that of the normal distance between eyes. Those findings[3] of a developmentally early phase can now be identified as showing a structural analogy to the symptoms of prosopagnosia.

In a previous comparison between stimuli eliciting SR and prosopagnosia only the general area of the 'eye region' was considered[9]. In doing so, some more generalized phrasing was used. This was probably triggered by the fact that so far the distinction between 'eye region' vs. 'one eye' has not yet been known to be essential. Thus, it was understood as if the prosopagnosia patient would 'orient himself by the eye region'[9], whereas it had been observed only that such patients direct their gaze at *one* eye[10] – as they try to orient themselves by *details* of the face. More importantly, it has further been observed, that it is precisely the 'eye region' (in its total configuration), which is *not* recognized in prosopagnosia[10–12] but which is experienced as distorted, as 'flattened out' and as 'without any relief'[10]. Such a specific distortion causes an appearance of an uninterrupted forehead-nose continuum with an obliteration of the bridge of the nose, whereby the individual human face is no longer recognizable.

Thus, there exists an analogy between the essential face configurations employed by neolithic artifacts, – especially effective in eliciting the SR in an early phase – and the specific prosopagnostic distortion of face recognition.

Aside from the neolithic face patterns' *specific* facilitation of the 'release' of young infants' SR, these 'early' face configurations apparently provide a second set of factors, which facilitate visual perception *in general*: a) figure – ground distinction[13–15], which is fostered by emphasizing outlines and neglecting 3-dimensional depth (especially around the bridge of the nose); b) emphasis on simple, regular geometrical forms[17,18], such as the sinusoidal type (NGr) as well as the long straight vertical midline type (NGl); c) emphasis on the vertical[16,17], i.e. on the nose, not on the mouth.

Preferential smiling response in infants to purely visual stimuli

| Age groups (in weeks) | 'Neolithic' masks (NGr or NGl) | Natural face of E | Total |
|---|---|---|---|
| 7–9 | 4 | 0 | 4 |
| 10–18 | 31 | 4 | 35 |
| 19–25 | 4 | 15 | 19 |
| Total | 39 | 19 | 58 |

$N = 101$. Non reactors, 36 belonging to the young age groups; eliminated, 7 ambiguous response; final sample, 58. $\chi = 27.7$; $p < 0.001$.


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Pattern recognition by computers was studied[17] and revealed very significant differences in retinal stability of various geometrical patterns: an empty circle was the most stable, and the second most stable pattern was that of a circle with a *vertical* bisector. (Note the similarity especially to the NGl type). Because of such findings, it was hypothesized[17]: 'the brain is equipped with a large number of recognition units which may be both genetically cast as well as acquired through experience'.

The fact that these early face configurations contain factors that facilitate perception points to an interrelation between the functioning of a perceptual apparatus and the external stimulus, the perception of which has survival value, a value which the human face has for the infant.

*Zusammenfassung.* Unter den visuellen Reizkonfigurationen, die das Kinderlächeln auslösen, wurde eine neue Klasse von Frühformen (NGr und NGl) experimentell identifiziert. Analoge Gesichtskonfigurationen sind in Frühdarstellungen des Gesichts in «neolithischer» Kunst sowie auch in der spezifischen Weise des visuellen Erlebens des Gesichts in Prosopagnosie zu finden.

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[19] This study was made possible by a Visiting Professorship at the University of Heidelberg, Department of Neurology. Thanks are due to Dir. Prof. Dr. H. GÄNSHIRT.

## PRO EXPERIMENTIS

### Trennung der Blutgruppenagglutinine an DEAE-Zellulose zur Erfassung der 0/A-Unverträglichkeit

Bei rund einem Fünftel aller Schwangerschaften liegt eine Unverträglichkeit der Blutgruppen AB0 von Mutter und Kind vor. Die häufigste unter diesen inkompatiblen Mutter-Kind-Konstellationen ist 0/A (9,4%), ferner findet man 0/B, B/AB (je 2,7%), seltener A/AB (1,5%) und B/A (0,8%)[1].

Trotz der Häufigkeit einer inkompatiblen Blutgruppenkonstellation ist jedoch eine Erkrankung des Kindes selten. Man nimmt an, dass in diesem Fall mütterliche Agglutinine des IgG-Typs die Plazentaschranke passiert haben. Die sichere serologische Diagnose einer Schädigung der kindlichen Erythrozyten ist häufig nicht möglich. Man versucht daher, die im mütterlichen Blut vorhandenen Agglutinine in solche vom IgM- und IgG-Typ zu differenzieren. Um diese Bestimmung einfach und zuverlässig durchführen zu können, wurde eine neue Methode entwickelt, die auf der selektiven Absorption von IgM an DEAE-Zellulose beruht. Dieser neue Test wurde mit der von REESINK et al.[2] publizierten Methode des Abbaus von IgM durch Merkaptoäthanol verglichen. Die im mütterlichen Blut erhaltenen Befunde wurden mit den klinischen Daten des zugehörigen Kindes verglichen, um die Brauchbarkeit der beiden Untersuchungsmethoden für die Labordiagnose der Erkrankung infolge Blutgruppen-Unverträglichkeit beurteilen zu können.

Die vorliegende Untersuchung beschränkt sich auf die 0/A- und B/AB-Konstellation.

*Methoden.* a) *Adsorption des IgM an DEAE-Zellulose.* 500 mg in 0.001 *M* Phosphatpuffer pH 6.8 suspendierte DEAE-Zellulose wird in Röhrchen pipettiert, zentrifugiert und dekantiert. 0.1 ml mit 0.001 *M* Phosphatpuffer $^1/_5$ verdünntes Serum wird mit der Zellulose vermischt, während 1 h unter gelegentlichem Schütteln bei Raumtemperatur inkubiert und zentrifugiert. Die im Überstand verbleibenden Anti-A-Antikörper vom IgG-Typ werden im indirekten Coombstest mit $A_1$-Erythrozyten bestimmt. Die vollständige Entfernung des IgM und der Gehalt an IgG im Überstand wurden mit der Mancini-Technik auf Partigen-Platten (Behring, Marburg) geprüft.

b) *Abbau des IgM mit Merkaptoäthanol*[2]. 0.1 ml Serum wird mit 0,1 ml 0,2 *M* Merkaptoäthanol in 0,1 *M* Phosphatpuffer pH 7.2 gemischt und während 2 h bei Raumtemperatur inkubiert. Die Probe wird mit 0.3 ml Phosphatpuffer verdünnt, und die Anti-A-Antikörper werden mit dem indirekten Coombstest bestimmt.

Bei beiden Methoden wurde ein Anti-A-Titer von $\geqq 1/20$ positiv bewertet.

*Untersuchungsmaterial und klinische Daten.* Von 118 Müttern wurden Blutproben untersucht, die kurz nach der Geburt entnommen wurden. Dabei wurde darauf geachtet, dass ungefähr die gleiche Zahl kompatibler und inkompatibler Blutgruppenkonstellationen vorlag. Den Krankengeschichten wurden die Blutgruppen von Mutter

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Tabelle I. Titerhöhe von Anti-A-IgG im ME- und DEAE-Zellulose-Test.

| Titervergleich bei 30 positiven Seren | | | | | | |
|---|---|---|---|---|---|---|
| Titer | 1/20 | 1/40 | 1/80 | 1/160 | 1/320 | |
| Anzahl Seren ME-Test | 7 | 7 | 9 | 4 | 3 | total 30 |
| DEAE-Zellulose-Test | 12 | 6 | 10 | 2 | 0 | total 30 |