

## Love Promotes Health

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### Abstract

Love has consequences for health and well-being. Engaging in joyful activities such as love may activate areas in the brain responsible for emotion, attention, motivation and memory (i.e., limbic structures), and it may further serve to control the autonomic nervous system, i.e., stress reduction. This specific CNS activity pattern appears to exert protective effects, even on the brain itself. Moreover, anxiolytic effects of pleasurable experiences may occur by promotion of an inhibitory tone in specific areas of the brain. Thus, love and pleasure clearly are capable of stimulating health, well-being and (re)productivity: This wonderful biological instrument makes procreation and maintenance of organisms and their species a deeply rewarding and pleasurable experience, thus ensuring survival, health, and perpetuation.

### Is love healthy?

Love has consequences for health and well-being. The better we understand the concrete neurobiology of love and its possible secondary implications, the greater is our respect for the significance and potency of love's role in mental and physical health [35]. Love is closely related to the concept of pleasure and 'positive psychology', i.e., joyful mental states, and therefore has become a feature not only of thorough psychological but also basic science research – e.g., neurobiology – and clinical medicine [15,16,19,20].

Love, particularly in the beginning (i.e., falling in love), can sometimes be stressful (Fig. 1). However, it still possesses a strong and overall stress reducing potential [20]. By helping individuals to cope with stressful situations and, at first, survive, love truly represents an essential 'ingredient' of a healthy and satisfying life. Reproduction and sexual behaviors are just one aspect of

love. Community, social support, health and survival (of the individual and the species) clearly indicate further beneficial properties of the biological love concept.

Social support has documented health benefits, and the absence of positive social interactions or social bonds is typically associated with both physical and mental illnesses [1,4,14,17,21,22,23,24,30,37,38]. Understanding the nature of physiological processes that regulate social attachment could also be of value for the treatment or prevention of disorders, such as depression or autism, which may involve dysfunctional social attachment [6,14,25,29,36]. For example, oxytocin is part of an endogenous homeostatic system, i.e., re-balancing. This system has the capacity to increase social attachment and other positive social behaviors, providing additional indirect benefits of sociality [6].

The brain harbors beneficial autoregulatory pathways and salutogenic functions that contribute to health by enabling one's experiences in life – e.g., love – to benefit one's health [14,16,19]. However, science has long neglected these capacities, i.e., self-care potential. Yet, in clinical medicine and particularly in integrative or mind/body medical settings, including certain forms of complementary medicine, these self-healing capacities of the mind-brain construct have become widely popular, and therefore research on the neurobiological and physiological pathways underlying such 'healthy' phenomena as love, or therapeutic touch etc., has now gained recognition, i.e., funding [11,13,16].

Professional clinical programs have recently evolved that rely on sophisticated research and use integrative medicine or stress management techniques and approaches: Stress management is a form of medical life style modification towards a healthier or more stress-resistant life (particularly with regard to hardiness against stress-associated disease processes) that has now proven to be efficient in a broad array of diseases and conditions, namely cardiovascular, immune, and neurological or psychiatric disorders, including prevention [14,16,34,51]. In other words: Stress management may improve health [4,13]. Hence, stress management techniques regularly include social support, meditation/relaxation techniques, and other pleasurable activities that induce feelings of well-being and protection, thereby facilitating positive affect, resilience, spirituality, "loving-kindness," compassion, and closeness or connectedness – states that resemble the love concept as discussed above [2,4,5,8,16,31,32,33,52]. Clearly, these activities and experiences have proven to be biologically and medically beneficial, that is, they help to stay healthy throughout the challenges of life or improve the healing process [14,26,45]. The placebo response may also be named here, since it depends on positive therapy expectations, trust or belief, and it potentially acts via the same neuronal reward pathways related to love, pleasure, motivation and behavior [9,15,16,19,39,46,48,54]. Effects may thus be observed on psychological or physiological levels, i.e., mind and body, truly indicating a holistic medical understanding of health and its secondary implications.

Love and compassion, i.e., loving-kindness, are integrated in mindfulness trainings such as mindfulness-based stress reduction [5,8,26]. Loving-kindness meditation has been used for centuries in the Buddhist tradition to develop love and transform anger into compassion [5]. In a recent pilot study, this type of intervention, delivered as an eight week program, helped to reduce chronic pain, psychological distress, and anger [5].

Positive emotions, compassion and happiness help us to feel better, particularly in stress, and further they improve bodily functions: Love, compassion and joy make our immune system function better and help to battle diseases [8,13,14,16,19,28]. Furthermore, current research on these topics made the wellness

concept evolve from a sometimes esoteric or non-scientific background and become a major focus of progressive medical science [15,16,27,28,47,53]. Well-being therefore is now acknowledged and recognized as a powerful behavioral tool for supporting motivation and decision making, that is, choosing activities that engage rather than numb our minds: If we heed what gives us immediate pleasure and if we are skeptical of our 'error-riddled' memories and predictions, we can learn to spend our money, time and attention in ways that make us happier [19,27,28,42,53].

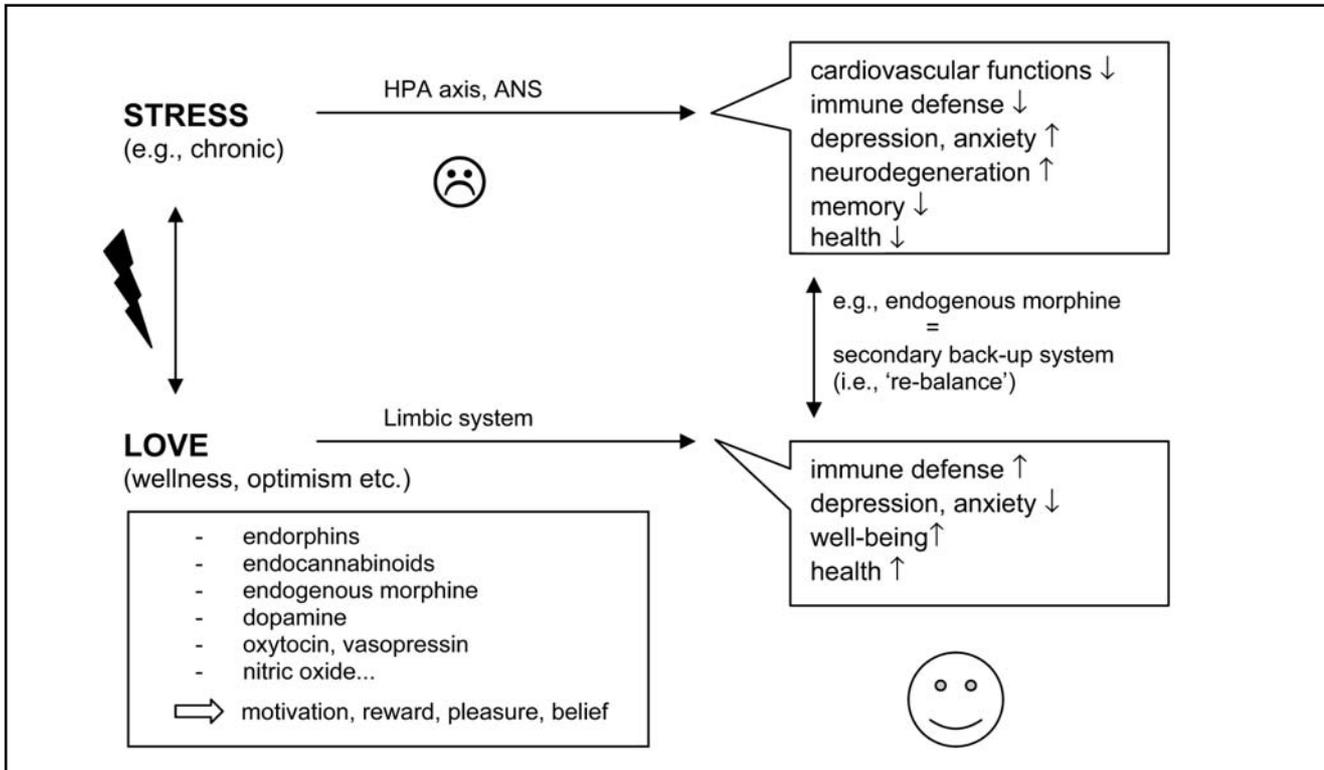
Survival and reproduction depend on the ability to adapt patterns of social and reproductive behaviors to environmental and social demands, i.e., flexibility [6]. Moderate pleasurable experiences, however, are able to enhance biological flexibility, complexity and health protection [12,14,19]. Thus, pleasure can be a resistance resource, or it may serve salutogenesis and prevention [11,19]. Furthermore, love and pleasure facilitate trust and belief into the body's capability of restoring or maintaining health, i.e., self-healing capacities [44,48]. Thereby, pleasure promotes the desired state of dynamic balance illustrated above [12,19].

In humans, cognition and belief are vital for reward and pleasure experiences [16]. Social contacts, in addition, provide pleasure, hence survival [11,12,14]. These functions of love and pleasurable experiences may even stimulate personal growth and development [7,19,40,41,43,49]. Findings depicted in this work therefore indicate a fine balance between different physiological states and activity patterns of CNS regions involved in love and attachment formation [20]. This dynamic balance has to be maintained to promote healthy social interactions and relationships, which usually form the base of efficient reproductive behaviors [3,6,50]. On the other side, knowledge obtained in this area may also help to understand diseases or states where underlying brain circuitries are interrupted, i.e., malfunctioning.

Taken together, engaging in joyful activities such as love may activate areas in the brain responsible for emotion, attention, motivation and memory (i.e., limbic structures), and it may further serve to control the ANS, i.e., stress reduction [14,15,16,17,18,19,21,22,23,45,46,47]. This specific CNS activity pattern appears to exert protective effects, even on the brain itself [14,16]. Moreover, anxiolytic effects of pleasurable experiences may occur by promotion of an inhibitory tone in specific areas of the brain [10,19]. Thus, love and pleasure clearly are capable of stimulating health, well-being and (re)productivity: This wonderful biological instrument makes procreation and maintenance of organisms and their species a deeply rewarding and pleasurable experience [3], thus ensuring survival, health, and perpetuation.

## Conclusions

Love and pleasure carry the ability to heal or facilitate beneficial motivation and behavior, in addition to ensuring survival of individuals and their



**Figure 1. Love and Health.** Stress and love act as counter players: Adrenal steroids, related to the HPA axis, are particularly responsive to social and environmental demands, e.g., stress [6,17,21,23]. Under certain conditions, stressful experiences and HPA axis activity are followed by increased sexual, parental, and social behaviors or the formation of social bonds, thereby possibly reducing stress, that is, chronic stress in particular. Adrenal steroid-neuropeptide interactions, involving oxytocin and its receptors as well as other neuropeptides, may regulate the development of social attachments, while concurrently modulating the HPA axis [6]. Positive social behaviors, mediated through these same signaling systems, modulate HPA and ANS activity, thereby accounting for health benefits that are attributed to love and attachment. Taken together, love counteracts chronic stress. However, love itself, i.e., falling in love, can induce stress, which may then promote a state of arousal necessary for approach and appetitive behaviors or the overcoming of neophobia leading to attachment formation or social bonding. After all, love serves to enhance a sense of well-being and safety, using neurobiological means and physiological pathways for the support of social bonds, i.e., community. HPA – hypothalamic-pituitary-adrenal (axis); ANS – autonomic nervous system.

species. After all, love is a joyful, yet useful, activity that encompasses wellness and feelings of well-being – a rather holistic and integrative medical procedure! However, now we might only add little parts to the framework, including a possible involvement of endogenous opiate compounds in love-related signaling processes, leaving most of the questions open for further research.

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### REFERENCES

- 1 Amini F, Lewis T, Lannon R, Louie A, Baumbacher G, McGuinness T et al. Affect, attachment, memory: contributions toward psychobiologic integration. *Psychiatry* 1996; **59**:213–39.
- 2 Antonovsky A. Implications of socio-economic differentials in mortality for the health system. *Popul Bull* 1980; 42–52.
- 3 Bartels A, Zeki S. The neural correlates of maternal and romantic love. *Neuroimage* 2004; **21**:1155–66.
- 4 Blumenthal JA, Sherwood A, Babyak MA, Watkins LL, Waugh R, Georgiades A et al. Effects of exercise and stress management training on markers of cardiovascular risk in patients with ischemic heart disease: a randomized controlled trial. *JAMA* 2005; **293**:1626–34.
- 5 Carson JW, Keefe FJ, Lynch TR, et al. Loving-kindness meditation for chronic low back pain: Results from a pilot trial. *J Holist Nurs* 2005; In press.
- 6 Carter CS. Neuroendocrine perspectives on social attachment and love. *Psychoneuroendocrinology* 1998; **23**:779–818.
- 7 Csikszentmihalyi M. If we are so rich, why aren't we happy? *Am Psychol* 1999; **54**:821–7.
- 8 Davidson RJ, Kabat-Zinn J, Schumacher J, Rosenkranz M, Muller D, Santorelli SF et al. Alterations in brain and immune function produced by mindfulness meditation. *Psychosom Med* 2003; **65**: 564–70.
- 9 de la Fuente-Fernandez R, Schulzer M, Stoessl AJ. The placebo effect in neurological disorders. *Lancet Neurol* 2002; **1**:85–91.
- 10 Elias AN, Wilson AF. Serum hormonal concentrations following transcendental meditation—potential role of gamma aminobutyric acid. *Med Hypotheses* 1995; **44**:287–91.
- 11 Esch T. [Health in stress: Change in the stress concept and its significance for prevention, health and life style]. *Gesundheitswesen* 2002; **64**:73–81.
- 12 Esch T. [Stress, adaptation, and self-organization: balancing processes facilitate health and survival]. *Forsch Komplementarmed Klass Naturheilkd* 2003; **10**:330–41.
- 13 Esch T. [The significance of stress for the cardiovascular system: Stress-associated cardiovascular diseases and non-pharmaceutical therapy options]. *Apothekenmagazin* 2003; **21**:8–15.
- 14 Esch T, Fricchione GL, Stefano GB. The therapeutic use of the relaxation response in stress-related diseases. *Medical Science Monitor* 2003; **9**:RA23–RA34.
- 15 Esch T, Guarna M, Bianchi E, Stefano GB. Meditation and limbic processes. *Biofeedback* 2004; **32**:22–7.

- 16 Esch T, Guarna M, Bianchi E, Zhu W, Stefano GB. Commonalities in the central nervous system's involvement with complementary medical therapies: Limbic morphinergic processes. *Medical Science Monitor* 2004; **10**:MS6-MS17.
- 17 Esch T, Stefano GB. An overview of stress and its impact in immunological diseases. *Modern Aspects of Immunobiology* 2002; **2**: 187-92.
- 18 Esch T, Stefano GB. Proinflammation: A common denominator or initiator of different pathophysiological disease processes. *Medical Science Monitor* 2002; **8**:1-9.
- 19 Esch T, Stefano GB. The neurobiology of pleasure, reward processes, addiction and their health implications. *Neuroendocrinology Letters* 2004; **25**:235-51.
- 20 Esch T, Stefano GB. The Neurobiology of Love. *Neuroendocrinology Letters* 2005; In press.
- 21 Esch T, Stefano GB, Fricchione GL, Benson H. Stress in cardiovascular diseases. *Medical Science Monitor* 2002; **8**:RA93-RA101.
- 22 Esch T, Stefano GB, Fricchione GL, Benson H. Stress-related diseases: A potential role for nitric oxide. *Medical Science Monitor* 2002; **8**:RA103-RA118.
- 23 Esch T, Stefano GB, Fricchione GL, Benson H. The role of stress in neurodegenerative diseases and mental disorders. *Neuroendocrinology Letters* 2002; **23**:199-208.
- 24 House JS, Landis KR, Umberson D. Social relationships and health. *Science* 1988; **241**:540-5.
- 25 Insel TR. A neurobiological basis of social attachment. *Am J Psychiatry* 1997; **154**:726-35.
- 26 Kabat-Zinn J, Wheeler E, Light T, Skillings A, Scharf MJ, Cropley TG et al. Influence of a mindfulness meditation-based stress reduction intervention on rates of skin clearing in patients with moderate to severe psoriasis undergoing phototherapy (UVB) and photochemotherapy (PUVA). *Psychosom Med* 1998; **60**:625-32.
- 27 Kahneman D, Krueger AB, Schkade DA, Schwarz N, Stone AA. A survey method for characterizing daily life experience: the day reconstruction method. *Science* 2004; **306**:1776-80.
- 28 Keltner D. Expression and the course of life: studies of emotion, personality, and psychopathology from a social-functional perspective. *Ann NY Acad Sci* 2003; **1000**:222-43.
- 29 Kirkpatrick B. Affiliation and neuropsychiatric disorders: the deficit syndrome of schizophrenia. *Ann NY Acad Sci* 1997; **807**:455-68.
- 30 Knox SS, Uvnas-Moberg K. Social isolation and cardiovascular disease: an atherosclerotic pathway? *Psychoneuroendocrinology* 1998; **23**:877-90.
- 31 Kobasa SC, Maddi SR, Kahn S. Hardiness and health: a prospective study. *J Pers Soc Psychol* 1982; **42**:168-77.
- 32 Kobasa SC, Maddi SR, Puccetti MC, Zola MA. Effectiveness of hardiness, exercise and social support as resources against illness. *J Psychosom Res* 1985; **29**:525-33.
- 33 Kobasa SC, Spinetta JJ, Cohen J, Crano WD, Hatchett S, Kaplan BH et al. Social environment and social support. *Cancer* 1991; **67**: 788-93.
- 34 Koertge J, Weidner G, Elliott-Eller M, Scherwitz L, Merritt-Worden TA, Marlin R et al. Improvement in medical risk factors and quality of life in women and men with coronary artery disease in the Multicenter Lifestyle Demonstration Project. *Am J Cardiol* 2003; **91**:1316-22.
- 35 Komisaruk BR, Whipple B. Love as sensory stimulation: physiological consequences of its deprivation and expression. *Psychoneuroendocrinology* 1998; **23**:927-44.
- 36 Modahl C, Green L, Fein D, Morris M, Waterhouse L, Feinstein C et al. Plasma oxytocin levels in autistic children. *Biol Psychiatry* 1998; **43**:270-7.
- 37 Reite M, Boccia ML. Physiological aspects of adult attachment. In: Sperling MB, Bermann WH, editors. *Attachment in Adults*. New York: Guilford Press; 1994.
- 38 Ryff CD, Singer B. The contours of positive human health. *Psychological Inquiry* 1998; **9**:1-28.
- 39 Salamon E, Esch T, Stefano GB. The role of the amygdala in mediating sexual and emotional behavior via coupled nitric oxide release. *Acta Pharmacologica Sinica* 2005; **26**:389-95.
- 40 Salamon E, Kim M, Beaulieu J, Stefano GB. Sound therapy induced relaxation: down regulating stress processes and pathologies. *Med Sci Monit* 2003; **9**:RA96-RA101.
- 41 Salamon E, Stefano GB, Kim M. Music as an aid in the development of the social self. *Medical Science Monitor* 2002; **8**:SR35-SR38.
- 42 Sapolsky RM. The physiology and pathophysiology of unhappiness. In: Kahneman D, Diener E, Schwarz N, editors. *Well-Being: The foundations of hedonic psychology*. New York: Russell Sage Foundation; 1999.
- 43 Seligman ME. Helplessness: On depression, development, and death. New York: Freeman; 1992.
- 44 Slingsby BT, Stefano GB. Placebo: Harnessing the power within. *Modern Aspects of Immunobiology* 2000; **1**:144-6.
- 45 Stefano GB, Benson H, Fricchione GL, Esch T. *The Stress Response: Always good and when it is bad*. New York: Medical Science International; 2005.
- 46 Stefano GB, Esch T, Cadet P, Zhu W, Mantione K, Benson H. Endocannabinoids as autoregulatory signaling molecules: coupling to nitric oxide and a possible association with the relaxation response. *Med Sci Monit* 2003; **9**:RA63-RA75.
- 47 Stefano GB, Fricchione GL, Goumon Y, Esch T. Pain, immunity, opiate and opioid compounds and health. *Medical Science Monitor* 2005; **11**:MS47-MS53.
- 48 Stefano GB, Fricchione GL, Slingsby BT, Benson H. The placebo effect and relaxation response: Neural processes and their coupling to constitutive nitric oxide. *Brain Research: Brain Research Reviews* 2001; **35**:1-19.
- 49 Stefano GB, Zhu W, Cadet P, Salamon E, Mantione KJ. Music alters constitutively expressed opiate and cytokine processes in listeners. *Medical Science Monitor* 2004; **10**:MS18-MS27.
- 50 Uvnas-Moberg K. Physiological and endocrine effects of social contact. *Ann NY Acad Sci* 1997; **807**:146-63.
- 51 Willett WC. Balancing life-style and genomics research for disease prevention. *Science* 2002; **296**:695-8.
- 52 Williams R, Kiecolt-Glaser J, Legato MJ, Ornish D, Powell LH, Syme SL et al. The impact of emotions on cardiovascular health. *J Gend Specif Med* 1999; **2**:52-8.
- 53 Wilson TD, Centerbar DB, Kermer DA, Gilbert DT. The pleasures of uncertainty: prolonging positive moods in ways people do not anticipate. *J Pers Soc Psychol* 2005; **88**:5-21.
- 54 Zhu W, Ma Y, Bell A, Esch T, Guarna M, Bilfinger TV et al. Presence of morphine in rat amygdala: Evidence for the 3 opiate receptor subtype via nitric oxide release in limbic structures. *Med Sci Monit* 2004; **10**:BR433-BR439.

## Jacques Prévert: Pour faire le portrait d'un oiseau

### Pour faire le portrait d'un oiseau

*Peindre d'abord une cage  
avec une porte ouverte  
peindre ensuite  
quelque chose de joli  
quelque chose de simple  
quelque chose de beau  
quelque chose d'utile  
pour l'oiseau  
placer ensuite la toile contre un arbre  
dans un jardin  
dans un bois  
ou dans une forêt  
se cacher derrière l'arbre  
sans rien dire  
sans bouger ...  
Parfois l'oiseau arrive vite  
mais il peut aussi bien mettre  
de longues années  
avant de se décider  
Ne pas se décourager  
attendre  
attendre s'il le faut pendant des années  
la vitesse ou la lenteur de l'arrivée  
de l'oiseau  
n'ayant aucun rapport  
avec la réussite du tableau  
Quand l'oiseau arrive  
s'il arrive  
observer le plus profond silence  
attendre que l'oiseau entre dans la cage  
et quand il est entré  
fermer doucement la porte avec  
le pinceau  
puis  
effacer un à un tous les barreaux  
en ayant soin de ne toucher  
aucune des plumes de l'oiseau  
Faire ensuite le portrait de l'arbre  
en choisissant la plus belle de ses branches  
pour l'oiseau  
peindre aussi le vert feuillage et  
la fraîcheur du vent  
la poussière du soleil  
et le bruit des bêtes de l'herbe  
dans la chaleur de l'été  
et puis attendre que l'oiseau  
se décide à chanter  
Si l'oiseau ne chante pas  
c'est mauvais signe  
signe que le tableau est mauvais  
mais s'il chante c'est bon signe  
signe que vous pouvez signer  
Alors vous arrachez tout doucement  
une des plumes de l'oiseau  
et vous écrivez votre nom dans un  
coin du tableau.*

### Jak namalovat portrét ptáka

*Musíte nejdřív namalovat klec  
s otevřenými dvířky  
pak namalovat  
pro ptáka  
něco krásného  
a prostého  
a milého  
co ptáka přiláká  
postavit plátno poblíž stromu  
na zahradě  
v hájku  
nebo v lese  
ukrýt se za strom  
a mlčet  
nehnout ani brvou...  
Někdy pták přiletí hned se vši kuráží  
a jindy váhá celé roky  
než se odváží  
Nesmíte ztratit trpělivost  
čekat  
čekat třeba celou věčnost  
Čas čekání  
však není nijak úměrný  
kvalitě obrazu  
Když konečně pták přiletí  
pokud přiletí že  
musíte mlčet z hloubi duše  
počkat až vletí do klece  
a když je uvnitř  
musíte zlehka zavřít štetcem dvířka  
a potom  
smazat všechny mříže  
a dávat pozor abyste mu nezkrřivili ani  
pírko  
Musíte namalovat strom  
a najít pro ptáka  
tu nejkrásnější větev  
a namalovat listí na větvích a svěží vánek  
sluneční paprsky  
a bzukot hmyzu v žáru léta  
a potom čekat až pták začne zpívat  
Festliže nezpívá  
je to zlé znamení  
znamení že obraz není k ničemu než k  
vyhození  
Když zpívá je to dobré znamení  
znamení že obraz je bez kazu  
Zlehynka vytrhněte  
jedno z ptačích per  
a napište své jméno v rohu obrazu.*

(in Czech)

### To paint a bird's portrait

*First of all, paint a cage  
with an opened little door  
then paint something attractive  
something simple  
something beautiful  
something of benefit for the bird  
Put the picture on a tree  
in a garden  
in a wood  
or in a forest  
hide yourself behind the tree  
silent  
immovable...*

*Sometimes the bird arrives quickly  
but sometimes it takes years  
Don't be discouraged  
wait  
wait for years if necessary  
the rapidity or the slowness of the arrival  
doesn't have any relationship  
with the result of the picture*

*When the bird comes  
if it comes  
keep the deepest silence  
wait until the bird enters the cage  
and when entered in  
Close the door softly with the brush  
then remove one by the one all the bars  
care not to touch any feather of the bird*

*Then draw the portrait of the tree  
choosing the most beautiful branch  
for the bird  
paint also the green foliage and the coolness  
of the beasts of the grass in the summer's heat  
and then, wait that the bird starts singing*

*If the bird doesn't sing  
it's a bad sign  
it means that the picture is wrong  
but if it sings it's a good sign  
it means that you can sign*

*so you tear with sweetness  
a feather from the bird  
and write your name in a corner  
of the painting*

(in English)