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Blind museum visitors:
methodical tips for museum
presentation and education

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Introduction

The methodical guide you just opened is primarily intended for beginning museum educators or educational workers in other cultural and memory institutions, for whom the collaboration with blind visitors is a novelty or who just begin to think about it. The book summarizes the basic information and provides practical tips for the work with blind museum visitors. You will learn how to make a museum more accessible and how to remove physical barriers, you will understand how blind people perceive and learn and you will gain impulses for your own educational work with blind museum visitors. The publication is translated from the original methodical guide intended for Czech readers, with references to sources mostly in Czech language, but also to other works published in English. Museums are by their very nature primarily visual institutions; they are predominantly working with tangible collections and communicate them visually to the public. This goal undoubtedly generates challenges with regard to blind visitors and requires an overall change in the philosophy of the museums' approach to audience whose ability to use eyesight in the cognitive and learning process is decreased or absent at all. The methodical guide is focused on blind people because they usually require a completely different approach and conditions of accessibility than all the other groups of visually impaired visitors. In the text we are using the term blind, or we are talking about a group of severely visually impaired people that also includes the blind. Other visual impairments were mentioned in the text to illustrate the differences which gave rise to different provisions or concepts of exhibition and education activities in museums. The issue of an inclusive approach and the work of museums with blind visitors have a tradition in the Czech Republic, therefore we were able to present the phenomenon of the so-called museums of the blind (in both local and international context) and to make use of our own experience with creation of specialized exhibition and education projects in the past few decades.

How to effectively work with this methodical guide? If you are beginners, concentrate first on general information about the blind, their cognitive and learning skills, mobility and orientation. Fundamental knowledge is highlighted as important. If you need to know more, pay attention to references in brackets, which are completely listed at the end of the text, or search for additional information on relevant topics. If you are rather looking for inspiration for the practical activity, concentrate on the emphasized tips and recommendations, which also reflect the most frequent mistakes in practice. The text of the methodical guide also responds to questions which are most frequently asked by inquisitive museum workers and students. They not only concern the creation of suitable conditions for blind museum visitors, but often provide a more complex insight into the whole problem through understanding the daily life of the blind.

Lucie Jagošová and Eliška Hluší

1. Spectrum of visual impairments and characterization of the blind

For sighted people, vision represents the dominant sense – it is commonly believed that vision is the most intensively used sense and as much as 90 % of all information are acquired through visual perception. The limitation of sight thus logically affects our everyday life in a fundamental way, makes orientation and possible reactions to unexpected situations difficult, and seriously affects our career possibilities, leisure time activities, social contacts and communication. Museum visitors with various limitations of visual perception represent a relatively often represented group of special audiences – from light forms through severe vision disorders to the total absence of vision. The issues of visually impaired visitors and their education are treated by typhlopedia – one of the disciplines of special education, and by the inclusive museum education, which is a subdiscipline of museum education.

Who belongs to the group of people with limitations of visual perception? The wide spectrum of vision disorders comprises above all the congenital or acquired visual impairment, which is caused e.g. by refractive errors (blurred vision, e.g. nearsightedness, farsightedness, astigmatism), as well as cataract, glaucoma, macular degeneration etc. In addition to blurred vision, visual field defects, colour vision deficiency, night-blindness, or photophobia also occur. Vision disorders also include binocular vision dysfunctions, which are usually connected with partial functional limitation of a single eye, e.g. strabismus (abnormal alignment of one or both eyes, squint) or amblyopia, also called lazy eye (decreased vision in a single eye, usually without any organic cause), as well as residual vision. The most severe form is blindness, which can be either congenital or acquired during the lifetime (Ludíková 2002, pp. 26–28; *Základy muzejní pedagogiky: Studijní texty* 2014; *Muzejní edukátor: Studijní materiál* [2019], pp. 202–203).

+ Important: **Different cognitive abilities in people with severe vision disorders**

Blind people are divided depending on when their disability occurred. The first category comprises persons blind from birth, whose imagination degree depends on whether they were explained everything in their childhood and whether they were allowed to touch various things. Also important is whether at all and how their visual and auditory stimulation has been developed since the early childhood. Another group includes the practically blind persons, who cannot tell the difference between shapes or colours, but they can still distinguish between light and dark. These people have various visual impairments, e.g. scotoma or “tunnel” vision, which distinctly diminishes their field of vision, so that they see objects as if they were looking through a narrow tube. Other visitors may gradually lose their vision or have already lost it during their life. These visitors remember their perceptions from the time before they lost their vision.

Blindness and blind people, on whom the methodical guide is primarily focused, cannot be regarded as a compact group without any possibility of visual perception. On the contrary, we distinguish various levels of limitation of visual perception, where blindness is divided into practical

(enables to distinguish between light and dark) and total. According to another typology, blindness is divided into three categories – practical blindness, true blindness (these two types are distinguished on the basis of accurate values of the best correcting lenses and the decrease in angular distance of the binocular visual field) and total blindness (the spectrum ranging from preserved light sensitivity with defective light projection to the total absence of light sensitivity). The causes for the onset of blindness are congenital (e.g. heredity, viral infection during pregnancy) and acquired during the life (e.g. injury, infection, progressive vision disorders, tumours, poisoning etc.). In general, we can say that blind people may retain several visual functions, but their successful perception and processing of information requires compensatory senses (i.e. other well-functioning human senses and higher mental functions) (cf. Ludíková 2002, pp. 26–28; Štainerová 2017, pp. 11–12).

Another important fact to be considered is that the visual impairment in humans does not necessarily occur isolated but in the form of various combined disorders (low vision and a restriction of the musculoskeletal system, or some other sensory impairment). As regards the communication and interaction, a very specific and at the same time very severe impairment is **deaf-blindness**. It is neither a simple combination of two disorders – variously intensive (partial or total) loss of vision and hearing, nor a mere sum of their effects. The impairment rate in the above-mentioned two senses is multiplied because deaf-blind people cannot compensate the loss of one sense by the other sense. The majority of deaf-blind people acquired their vision and hearing impairment later in life, but it may also be caused by an injury (more detailed information is available e.g. from the website *Lorm – Společnost pro hluchoslepé*).

Before we even begin to consider appropriate ways of making the museum exhibitions and events accessible to the public or modifying them to better meet the special needs of blind visitors, we must take into consideration the differences between individual subgroups of severely visually impaired visitors and the differences in the competences they have acquired. Apart from the type and extent of impairment and the time of its onset, we must also consider how the blind visitors move and orient themselves in space and what are the specifics of their cognitive and learning skills. After having learned the information included in the following chapters, we will be able to implement the acquired knowledge in the museum, in its exhibition rooms, in the preparation of educational programmes and in practical work with blind visitors.

2. How blind people perceive, learn and create

A prerequisite for educational activity in general, and thus also for museum education, is to understand the specifics of how blind visitors acquire new knowledge and skills and what the specifics of this cognitive process are for blind people. While searching for the general characteristics of the behaviour and communication of blind people, we can base ourselves on a publication by the Czech typhlo-pedagogue Josef Smýkal (2018, pp. 145–147), who derives the behaviour of the blind, which we must take into account during education, from three basic aspects:

1) According to the abilities needed for basic human activities (and the predominant form of applying the life knowledge), he distinguished two types (which do not have to be sharply defined) – **manual and intellectual**.

2) According to the predominant forms of reactions to stimuli, he specified the **reflexive** type (with well-considered but sometimes also indecisive reactions) and **naive** type (reactions are rather immediate and prompt).

3) According to the predominant specifics in the perception and recall of perceptions and information, he characterized the **auditory** (with an increased ability to analyse sounds and with hearing as the dominant sense), **tactile** (with predominant tactile sensations and reactions and with touch as the dominant sense) and **motor** perception (with an increased physical mobility but also with an adequate mental approach, which is a very valuable prevention of the mobility conservatism and stereotypic life).

All these types can overlap and combine with one another, but in individual blind persons we can observe a predominance of several prerequisites according to the above-mentioned characteristics, which then also logically determine the preferred methods of perception and learning. The perception and learning of blind people are therefore closely related to **individual possibilities** and intensity of **use of individual senses**. Regarding the fact that blind people belong to the most severely visually impaired persons, their imagination and visual memory depend on whether they are blind from birth, or whether they lost their vision during their life. An important boundary is the 5th–7th year of life, so if they lost their vision before this period, it is very likely that their visual imagination is not firmly anchored and gradually disappears. The phase of life during which blind people lost their vision has a significant impact on how they use the sense of touch (above all with the help of hands). It serves as the main sense for the formation of spatial ideas and the tactile sensitivity replaces visual perception. **Touch** represents a proximal or contact sense, in contrast to the distal sense of vision, which enables to perceive large and distant objects within a single view (in more detail e.g. Raková 2017). The sense of touch helps blind people perceive e.g. shape, size, three-dimensionality, hardness, softness, smoothness, roughness, temperature, weight, immobility, motion, direction. In addition to direct tactile perception of objects, this sense also plays an important role in the development of orientation skills. The organs of tactile sensation are not only fingertips, but also other places of human skin (foot sole, tongue) (Smýkal 2018, pp. 143, 162–163).

+ Important: **The forms of tactile perception in blind people**

Within the tactile perception of the blind, we distinguish between **passive touch** (stimuli obtained e.g. by putting a hand on a static object to sense properties like length, temperature, three-dimensionality etc.), which provides basic contact with an object, **active touch**, which brings a comprehensive haptic perception, and **mediated touch** (instrumental), where the object is touched with the help of some tool or equipment (e.g. white cane) or individual body parts (tongue, lips). Active tactile perception usually has the following phases:

- 1) Blind person uses hands to sense the position, approximate shape and size of an object.
- 2) Afterwards, the blind concentrates on details, investigates and analyses them thoroughly.
- 3) Blind person touches the entire object again and thus creates a more accurate idea of its overall shape and relations between individual details.

In tactile perception, blind people use one or both hands, which increases the speed and accuracy of recognizing both large and small objects. When exploring very small objects by touch, it is possible to combine the touching by hands with using the mouth and tongue (suitable e.g. for threading a needle) (Veithová 2011, pp. 15–17).

Blind people orient themselves in space not only by touch but at the same time also by **hearing** (intensity, rhythm and spectrum of sounds). The tonal sensitivity, which is essential for auditory perception (be it human speech, ambient sounds, listening to music, or one's own artistic production) is conditioned by the sensitivity to timbre of sounds and tones, perception of pitch and changes in sounds, as well as by the modulation factors. We must emphasize again the necessity of an individual approach – blind people cannot be regarded as a fully “consistent” group – apart from the total absence of visual perception, individual persons can have a preserved light sensitivity, distance perception or partially preserved colour and shape perception etc., so that they are able to at least partly use visual stimuli as well as visual imagination in combination with other senses (Smýkal 2018, pp. 143, 162–163). Tactile perception gives the blind person a more accurate image than auditory perception because the sense of touch enables to receive many stimuli which are otherwise obtained by vision (with exception of colour and distance perception) (cf. Veithová 2011, p. 15).

In blind pupils and students, it is suitable to incite the development of **lower** (the use of other senses, such as hearing, touch, taste, smell) and **higher** (memory, thinking, imagery, imagination, speech) **compensatory factors**, which enable the perception of the outside world and learning, and to support reading and writing Braille¹ (Štainerová 2017, pp. 11–12). **Individual abilities** of blind people, i.e. to what extent they are able to develop their skills with regard to limitation or absence of their visual perception, are of crucial importance in any form of education. However, the loss of vision, apart from some limitations, can also incite the development of other creative and artistic skills as well as common skills (e.g. emotional, abstracting, compensatory). Inevitable prerequisites for any creative activity and development are the personal **motivation**, maintenance of an **optimistic life attitude** and **intellectual potential** of the blind. **Thinking** in general is conditioned by sensory perception and the thought constructs in blind people emerge in connection with their active participation and practical activity. The blind do not differ from the others only by the vision disorder itself. Their visual impairment has an impact on mental activity and generates specific internal and external conditions, under which they can undergo further intellectual, emotional, cultural and artistic development (i.e. the extent to which they are able to develop their skills with regard to their vision deficiency) in the sphere of both their professional career and leisure activities (cf. Smýkal 2018, pp. 145, 155–156). The higher demands placed on mental activity of the blind, in comparison with sighted people, are caused by the fact that they must use the senses of touch, hearing and smell instead of vision. Situations may occur where the blind are not able to

¹ In the text of the methodical guide, the word Braille with uppercase initial (i.e. developed by L. Braille) refers to a specific script used by the blind. The word braille with lowercase initial (i.e. making use of the Braille script) is mainly used in connection with assistive technological devices – braille keyboard, refreshable braille display, braille embosser etc.

perceive details or characteristic properties with these compensatory senses, so their picture of reality may be incomplete. The role of **memory** in blind people is of key importance because, in contrast to the sighted, they must memorize more information (and be able to recall it from the memory without the help of other senses). Moreover, the limited number of simultaneously usable senses can cause a slower memorization (and the limited possibility to repeatedly perceive the acquired information commonly results in more frequent forgetting of that knowledge). The elimination of visual sensors can also influence the **attention** of the blind, which must be strengthened by a simultaneous involvement of tactile and auditory perception. **Volitional properties** of blind people are manifested individually; their development is mainly determined by upbringing and motivation to activity, achievement of preset goals and satisfaction of educational and cultural needs. The lack of vision most distinctly affects the **emotional displays** of the blind in the form of external expressions, gestures and facial mimics, which occur in a muted form (cf. Veithová 2011, pp. 9–13).

The blind can thus perceive, obtain information, learn and communicate mainly through speech (using e.g. a phone or a voice recorder), hearing (by listening to spoken word or audio recordings) and touch (inasmuch as they mastered the Braille script and tactile sensation) (Ludiková 2002, pp. 26–28; *Základy muzejní pedagogiky: Studijní texty 2014; Muzejní edukátor: Studijní materiál* [2019], pp. 202–203). One of the main methods of an active obtaining of information and cognitive development is **active reading**. In persons with vision disorders, we distinguish two completely different variants of how to read actively – reading a common script by vision (where physiologically possible, with some graphic adjustments or using some assistive aids; this applies to partially sighted persons) or reading by touch, with the help of a special script for the blind, the so-called Braille.

+ Important: **What is Braille**

Braille is a special tactile writing system intended for blind people and people with low vision. It was named after its creator, the French teacher Louis Braille (1809–1852), who, after having lost his sight in childhood, developed this code by modifying the French military system of night writing. It is based on the principle of raised dots embossed in paper or some other suitable material, which the reader perceives through touch (for more details, see e.g. the website of *Tyfloklub České Budějovice* [2009–2019]) – namely by the index fingers of both hands (one hand reads the information in the text and the other controls the proper sequence of individual rows). Each braille character or “cell” is made up of 6 dot positions arranged in a rectangle comprising 2 columns of 3 dots each. A dot may be raised at any of the 6 positions, which as a result gives 64 possible combinations for letters. Each cell is sized 5 x 7.5 mm and its fixed dimensions cannot be arbitrarily changed (the character must fit the size of a fingertip, usually that of the index finger). Braille assignments have also been created for mathematical and musical notation. One standard printed page transcribed in Braille covers 2 to 3 pages in A4 format. Braille may be produced by hand using a slate and stylus or with the help of a Picht braille typewriter; visually impaired computer users can use a refreshable braille display, which turns a text line into tactile form. In the Czech Republic, books for the blind are printed by the Karel Emanuel Macan Printing House in Prague. The skill of reading Braille is hardly learned by people who have gone blind as adults or by persons with a diminished sensitivity of fingertips. These persons can use special aids, e.g. a screen reader with speech output (see *Deset zajímavostí o Braillovu písmu* 2019).



Fig. 1: A 1920s Braille alphabet board from the Institute for the Blind in Brno; Technical Museum in Brno, Czech Republic; Photo: Eva Řezáčová

A significant source of learning is also represented by **audio books**, accessible to the blind through auditory perception, which contain spoken-word recordings of literary works, studies, lectures etc. The device to play audio books or other audio recordings therefore belongs to the essential equipment of a blind student and so does also the device (or functions of a device), which enables to record information in the form of audio recordings (e.g. one's own notes or notes from teaching), or tactile recordings (e.g. electronic notetaker for the blind) and store the data for further use. Besides audio books, the so-called **hybrid books** also exist, which enable the user to follow their content simultaneously in the form of text and audio recording and at the same time contain a navigation system for better orientation in the book.

+ Interesting: **Audio library of the K. E. Macan Library and Printing House for the Blind in Prague**

The blind and severely visually impaired people in the Czech Republic can acquire materials for study and leisure activities in the K. E. Macan Library and Printing House for the Blind ([2020], see O nás; on history of the library Smýkal 2018, p. 160) with the headquarters in Prague and with a system of regional branches in the form of special audio departments in local public libraries throughout the Czech Republic. The services of this specialized library include loans of audio books (on CD and in MP3 format, with the option of copying data to own storage devices, e.g. a USB flash drive) and publications in Braille (including sheet music) and in large print, digital texts and relief graphics, journals, non-fiction and fiction books, storybooks for children, but also assistive aids, tactile games and toys. Other services also include the sale of publications or conversions and transcriptions of audio and printed documents (e.g. from analogue audio recordings to the MP3 format, individual transcriptions of texts to the Braille script or notes to the Braille music notation). The mission of the institution is to make information and art accessible, thus supporting the blind and severely visually impaired people in their studies and helping them find their way to reading.

The spectrum of activities, in which disabled people work both with dominantly used senses and with impaired senses and strive for further development with the help of learning and cognitive tools, is closely related to **basic didactic methods of special education**, namely the methods of **re-education, compensation and rehabilitation**. The support of visual perception, if possible (i.e. in persons with residual vision, low vision, or binocular vision dysfunctions), is using the method of re-education of vision. This approach employs the methods and procedures of special education, which are applied in effort to improve the performance of an impaired function, in this case vision. On the other hand, compensatory methods are intended to train the normally operating senses and functions, which are used by the impaired people as compensatory or substitutive. The limited or absent vision is thus compensated by other senses, above all by touch and hearing, to an extent which corresponds to individual abilities of the blind. The aim of these procedures is to help decrease the information deficiency in the blind and support them in mastering their common daily routines under the given conditions. Rehabilitation represents a series of accomplished socio-educational steps, which are targeted at the full integration of the blind into society, they enable them

to participate in education and culture and support them in their own personal and professional development (cf. Štainerová 2017, p. 31).

Education of the blind in general (and particularly the school education) is mainly focused on specifics which may result from blindness, namely the disturbance of development of cognitive processes and sensorimotor functions, disturbance of imagination in the form of fragmentariness (incomplete picture of reality without perception of details) and schematism (in the case of residual vision, it is an inaccurate perception of objects and colours or a decreased differentiation of letters, numeral digits and other symbols) of memory and speech, information barriers and sensory deficiency. Diminished attention, slower work pace and easier exhaustion also can occur (cf. Štainerová 2017, p. 38; Veithová 2011, p. 10).

The competences and interests of blind people are reflected in their career focus and (future) profession, as well as in the **ways of spending leisure time and choosing hobbies**. The studies at vocational high schools or universities can sometimes steer the blind towards art disciplines (especially the study of music and playing musical instruments) or special education (including the teaching fields), but also to other disciplines (e.g. study of foreign languages) or training for practical professions and crafts. The expanding spectrum of various (assistive) aids and possibilities of studying (including the extending special educational support for students) and the removal of barriers give rise to a much wider platform of career possibilities for blind people than it was with traditional professions of the blind in the past (see e.g. the typical professions of the blind like telephonist, masseur etc., whose dominance among the professions for blind people may gradually retreat in favour of other specializations, e.g. social work, psychology etc., and in favour of a generally more balanced spectrum of specializations). The limitation of visual perception also considerably affects (or limits) the extent and spectrum of hobbies, but thanks to the gradual development of inclusive approaches and adequate methods and tools, blind people are able to spend their leisure time actively, performing various creative or motor activities, such as visual arts or sport.

2.1 Educational, informational and assistive aids for the blind

In daily life as well as in education (within the typhlo-didactics) of blind people, a range of **specific tools** (also called typhlotools) are largely used, including various assistive aids, electronic devices and other, mostly material, didactic tools, which either employ or substitute the dysfunctional sense. We can find a relatively variegated spectrum of typologies of these assistive aids, which put the main emphasis on the degree of disability, age, purpose (e.g. teaching aids, tools for individual topics or school subjects), on areas, where these tools shall be used (e.g. at work, in studies, leisure time, daily self-service activities, for spatial orientation, diagnostics or re-education etc.), on material and technical characteristics of these tools (e.g. standard, textual, optical, non-optical, electronic, audiovisual and auditory) or on the special educational approach (didactic, special didactic, re-educative or assistive aids). Unlike the past, when assistive aids were predominantly made by teachers of visually impaired pupils or by the visually impaired people them-

selves (many of them form the basis of specialized museum collections, documenting the life of the blind), their production was later adopted by manufacturing companies, which are specialized in the development of assistive aids for people with vision disorders.

Typical and widely known assistive aids for visually impaired people at various stages and degrees of disability include, for example, individual eyeglass corrections and magnifiers (hand-held, table, TV). Computers with a refreshable braille display and a speech output, braille typewriters or slate-and-stylus tools are primarily intended for the blind. Independent mobility is enabled by guide dogs, white canes for the blind or severely visually impaired people (red and white striped canes for the deaf-blind) and by other assistive technology for the orientation outdoors (e.g. artificial guiding lines, acoustic traffic signals at crossings, in public transportation, or acoustic orientation beacons installed on building entrances) or at home (e.g. acoustic boiling detectors, tactile or “talking” watches for the blind).

In the field of education, special aids are used to increase the efficiency of the education process, above all understanding and memorization of information and development of skills. The production of assistive aids has a tradition, and in many foreign countries as well as in the Czech Republic, these special aids are also part of special museum collections or museums specialized in the life, culture and education of the blind.

The width of the spectrum of these tools can be well illustrated by taking a look at the primary school education, where blind pupils can use **teaching aids** such as Picht braille typewriter, special calculating tools, models of numerals and mathematic symbols, raised number line for the blind, special drawing kit, scale-down and scale-up models for teaching national and natural history (e.g. models of human body, animals and plants, raised relief globes and folding relief maps, a clock model, various relief pictures), but also natural materials. In music education, it suggests itself to make the most of the pupils' hearing potential by using various rhythmic instruments, audio players, specialized keyboards, tactile aids for understanding note relations or Braille musical notation guides, and sound boxes with various materials inside for training the recognition of sounds. An increased caution and safety must be observed during physical education classes and sports activities in general. The sports aids used include various audible balls (e.g. for the Showdown, a specific sport for the blind, which is played on a special table with paddles and a small audible ball), acoustic beacons, pellet bells, audible bracelets or rubber bands, balls with waistbands or rubber tethers for running together with a teacher, trampoline with handgrips, or, for example, a tandem bicycle or tricycle. In work and art education, a variety of materials are used, including suitable products of nature. The tools for art education also include, for example, special modelling clay, finger paints and paints that leave tactile marks, pins with large heads, scissors for the blind. Various technical devices are also used for teaching information and communication technologies, e.g. a digital reading device, braille printer, relief printing of the Latin script, graphic printing, a screen reader, software for mobile phones and tablets (cf. Štainerová 2017, pp. 38–53).

+ Important: **What are typhlographics and relief images**

Typhlographics serve to stimulate the process of perception and imagination of objects, to develop thinking, and they are a suitable means of demonstrative teaching for visually impaired peo-



Fig. 2: Picht braille typewriter; Technical Museum in Brno, Czech Republic; Photo: Eva Řezáčová

ple, mostly the blind. These special drawings are made with the technique of relief lines or bas-reliefs, where a three-dimensional object is depicted as a tactile image on a two-dimensional flat surface (if the visual perception is possible, the drawing is supplemented with contrast colours). The basic forms of pictorial expression through the typhlographics are represented by iconic relief images describing how things look (realistic images of objects, situational images), depiction of spatial aspects (maps, plans, technical drawings), symbolic images expressing the relations between pictures and phenomena (diagrams, graphs) and signal images including simple codes which draw attention to some phenomenon, object or situation (pictograms). Typhlographic depiction depends on the properties of materials and the means of expression used. The basic technical parameters of relief images include the raised relief dot, relief line and relief surface. As regards the materials used, important is the background (materials like paper, wood, plastic, metal sheets, textile, leather, clay or plasticine are used) and the material of relief dots, lines or surfaces (threads, wires, plugs, pasty materials, relief colours, mosaic and modular elements etc.) (more on this topic e.g. Veithová 2011, pp. 28–29).

Now we will take a closer look at the aids from the category of **assistive technology**, which enable blind people to study and make their studies easier. They also enable them to work more intensively with text and information, i.e. not only reading, but also writing, editing and printing notes. One of the most advanced assistive technology devices for blind computer users is the tactile text output called **refreshable braille display**. This device displays individual characters from the monitor in tactile form of the Braille script. Blind people are thus able to read any text in digital form and thereby enjoy a wide access, higher comfort and accuracy in working with literature and other sources. This allows them to study and to do more challenging jobs without major limitations. The main advantage of a refreshable braille display, when compared to the variant using a speech output, is that it offers blind users a closer and active contact with information on the computer

monitor and the possibility of its editing (it facilitates e.g. the filling in of Internet forms, working with texts in foreign languages, tables, and graphic editing of the text). In some cases, a braille terminal is also used as the input device (for more details, see *Braillovské řádky* [2009]).

Assistive technology which is commonly used in education also includes **Braille and speech notetakers**, whose main advantage is their easy portability and operation. These computer-based devices in their basic version enable to write notes, which can subsequently be edited, printed and used for further work – they are an equivalent of paper and pen used by the sighted. In former Czechoslovakia, special Braille and speech notetakers for the blind already occurred, although rather sporadically, before 1990. A well-known example of this type of assistive device from the 1990s is Eureka, which besides the text editor also contained e.g. a personal organizer, a telephone directory with the option to dial phone numbers using a modem, a file manager, a music editor and the environment for programming in the Basic language. The oldest device was gradually replaced by newer improved versions (more on this e.g. Konečný 2002). The blind of today, particularly young people and students, may also use common notebooks and voice notetakers as special notetakers to substitute or supplement the desk computer (although the absence of a braille keyboard and possibly also the dimensions and weight of the device might be indisputable disadvantages).

A useful and detailed overview of assistive aids for education, household use or common daily use, leisure time and sports activities is offered by the Czech-written publication *Kompenzační pomůcky pro uživatele se zrakovým postižením* (Bubeníčková, Karásek and Pavlíček 2019).

3. How blind people move and orient themselves in space

Employees who are working in the area of museum presentation and education must not only understand how blind people receive stimuli from the outside world and how they learn, but also how they move and orient themselves in space and what aids and adjustments in their daily life enable and facilitate them to move independently and safely.

Firstly, we will concentrate on basic principles and context of how the blind people move in space and what problems are connected with their mobility. The basic **senses used in movement of a blind person** are touch, hearing and smell. Both direct (hand, foot sole) and indirect (cane) touch is used to sense the surface and its structure. Distortion of perceptions can be caused by one's own clothes and shoes, dirt on the road surface or bad weather. Hearing can be used to distinguish individual auditory stimuli from the outside world, to locate them more accurately and identify their distance, as well as to distinguish certain materials by tapping them with a cane. Distortions can again be caused by adverse weather conditions or by clothes (hat, hood). Smell provides the blind with complementary information (e.g. various scents in the surroundings). The **safety of a blind person** is influenced by their overall health, physical and mental condition, attention, adequate speed, ability to select essential sensory information about the outside world and to create a complete picture of their position in the environment which they move in. This demands the acquisition of many competences, among them **mastery of spatial orientation** (including straight walk, also across a street, distance estimation during walking, rotation and angle estimation, estimation of distance and sound source direction, ability to locate orientation points on the route – e.g. house corner, ticket vending machine near the guiding line or a place with an acoustic signal beacon), the **long white cane technique** (touch technique, touch & slide technique and appropriate contact with the guiding line, perception of the road shape), the use of transportation means, perception of the environment through compensatory senses, social skills. A safe movement through the environment is connected with keeping a safe distance from risky places and terrain obstacles (e.g. standalone flowerpots on a sidewalk, unfenced outdoor restaurant seating, seasonal terrain obstacles, such as snow barriers), which is secured by a proper use of the white cane or a correct position when being guided by another person, who can thus react to danger and stop in time. The blind can also use **electronic orientation aids**, which provide for the remote sensing of obstacles with the help of ultrasound or laser. The outdoor and indoor mobility of blind people is generally facilitated by a sufficient amount of traditional orientation cues, suitable arrangement of natural orientation points in space, and by artificial guiding lines with adequate tactile differences between various surfaces (more details, including particular situation examples, see Karásek [20??]).

+ Important: **White cane**

Severely visually impaired people may use a long white cane for their movement. Not every cane is used only by a blind person, therefore a universal term white cane is used (instead of cane for the blind, when we consider the wide spectrum of people who use a white cane). Its main functions include signalling (it alerts passers-by to a severely visually impaired person), protection



Fig. 3: Refreshable braille display; Technical Museum in Brno, Czech Republic; Photo: Eva Řezáčová

(it alerts its user to an obstacle in advance and helps to prevent collision), orientation (the cane helps its user find tactile points and symbols and facilitates spatial orientation and independent mobility), support (supportive device for elderly or sick people). Universal white cane does not exist. Its construction, shape of the handle and length depend on what functions the cane simultaneously fulfils and for what purpose it is used. We distinguish the **orientation cane** (sometimes also called long cane), **signalling cane** (it is rather worn by the blind when being guided by a person or guide dog or when moving in the interior of buildings) and **support cane** (combines the possibilities of support with the signalling function) (for more details, see *Bílá hole – kategorie a názvosloví bílých holí 2002–2015*).

3.1 Orientation aids in public space

The existence of **orientation aids in public space**, i.e. on public roads and pathways and in public buildings, provides for a much better orientation and independent (or guided) mobility of the blind, and brings benefits for their mental planning. The tactile and acoustic adaptations for the blind (persons with low vision can also use contrasting colour aids) are intended to increase the self-dependency of blind people, while observing the principles of their safety when moving on the streets and in public transport. These adaptations are usually supported by legislation (Building Act and relevant regulations), which also provides exact technical specifications.

Tactile elements primarily serve better orientation of blind people, who detect them mainly by a white cane and by foot. Exceptionally, they also have an informational function (labels in Braille or relief symbols). Typical example of a tactile element is the **guiding line**, which represents an easy-orientation corridor with no objects (obstacles) placed on the route. Outdoor natural guiding lines primarily use traditional cues, such as house walls or a kerb at the boundary between a sidewalk and lawn. Where the traditional cues are not available, their absence is compensated by artificial guiding lines, e.g. by tactile paving on railway station platforms as well as in larger open spaces. Their surface pattern is composed of longitudinal grooves running in the direction of pedestrian travel, which may be interrupted at places where the blind can turn, for example to a staircase. A special form of an artificial guiding line is the **signalling path**, guiding the blind to a specific location. It is used e.g. on railway station platforms to indicate the way to the entrance to a pedestrian underpass, or it leads from a guiding line to a public transport stop sign. The signalling path always ends at the meeting point with a natural or artificial guiding line. It can be detected by a white cane and by foot, its surface pattern is composed of raised truncated cones, and it usually has a contrasting colour. In pedestrian crossings where the orientation is complicated by a non-standard design (too long or diagonal crossings), a so-called **pedestrian crossing guidance path** is used. It consists of four parallel tactile strips applied to the carriageway (it is detectable only by the so-called touch & slide technique). At the boundary between a normally accessible area and a potentially hazardous area (e.g. the pedestrian and bicycle oriented spaces), a **warning path** with surface pattern in the form of raised truncated cones is used. It is detectable by a white cane and

by foot and the paving has a contrasting colour. The informational function, where necessary, is fulfilled by Braille labels, which are marking e.g. the underpass exits (on the backside of the right handrail before the first step of the staircase) or public transport platforms (usually on the right post of the stop sign), and by relief symbols e.g. on elevator control buttons and on interior door frames (*Hmatné úpravy pro nevidomé [20??]*).

Acoustic elements for the blind usually serve both orientation and information. They are controlled by commands from a remote control transmitter mounted on the handle of a smart cane, which activates the devices (at a minimum distance of 40 and maximum distance of 150 metres) installed in public spaces of many towns. **Acoustic or voice navigation beacon** is used to mark and to let easily find entrances to public buildings or pedestrian underpasses in railway stations. It is placed above the entry axis and is activated by the ultrasonic transmitter, which induces an acoustic announcement in the form of trill sounds (different for a level entrance and for a staircase) or a voice phrase (in addition, modern types also offer a detailed description of the area surrounding the beacon). Public transport vehicles in many towns (as well as several train sets) are equipped with a so-called **command set for the blind**. It is connected to the control unit of vehicles and comprises an outdoor (usually at the front door of a vehicle) and an indoor sound beacon (at the driver's cab). After being activated by the blind, it announces the line number and final destination and it also can alert the driver that there is a blind person who wants to board the vehicle. The probably best known and most used acoustic element is **acoustic signalling at pedestrian crossings with traffic lights**, distinguishing the frequency of acoustic signals for red and green (the latter is ca. four times faster). Staggered crossings usually include acoustic signals for two different walking directions, therefore it is necessary to use a special button on the traffic lights post to temporarily turn off the signal for the opposite walking direction. Since recently, large cities have the possibility to use the so-called smart public transport stops with **talking information boards** (after being activated, they announce the name of the stop, the exact time and the next four departure times). Electronic timetables with the option of voice output are also used in the railway traffic. Furthermore, an ultrasonic transmitter is also used e.g. with the **post office queue management system** in several Czech Post branch offices (it enables to log in to the system without the necessity to take a ticket and facilitates the access to the next available service counter) (Konečný 2018).

3.2 How to properly guide a blind person

Blind people often move outdoors and indoors independently, with the help of a white cane or other assistive aids. However, they can also be guided by another person or by a guide dog, which makes their orientation and mobility easier and faster, or they can ask for particular help (or use it, if they welcome the help and are offered and given it in an appropriate way). Communicating with an independently moving blind person and offering them advice, help or guidance has its rules. The communication with the blind and offering them an effective help demands an unhesitating and uninhibited approach and adoption of the main recommended rules.

+ Tips and recommendations: **Ten rules of courtesy to the blind** (borrowed from *Zásady komunikace a pomoci nevidomým* 2012):

1) Keep in mind that the blind are normal people who have various strengths and weaknesses like everyone else. There are special, intelligent and less gifted people among the blind.

2) When meeting a blind person, act naturally and with ease. Help where it is necessary, in a tactful and subtle way. However, do not force your help on anybody.

3) Avoid expressions of compassion – the present-day blind have absolutely no use for it. However, they will very much appreciate even the smallest help in difficult conditions. Therefore, do not allow other people to make disparaging or demeaning statements, the blind have an equal right to respect and recognition as everybody else.

4) Greet a blind acquaintance first, even though they are younger than you, and add their name, so that they know the greeting is meant for them.

5) When entering a room with a blind person in, make yourself clearly known. If the blind person does not recognize you by voice, say your name. Silent movement of an unknown person close by is of course very unpleasant. Also let the blind person know when you are leaving the room.

6) It is very unpleasant for the blind if you discuss their affairs not directly with them, but with their guide. The guide is only accompanying the blind, not representing them.

7) When the blind person finds him- or herself in orientation difficulties on the street, at a railway station, ask if you can help them. Loud noise, heavy rain and snow make it difficult for the blind to orient themselves. It is enough to offer the blind to lightly lean on your arm, which makes it possible for them to go a step behind you, follow your steps and react to everything in time.

8) When getting on board vehicles, never push the blind person in front of you, walk in front of them. Do not push the blind person into the seat, just place their hand on the back of the seat. When getting into the car, place their hand on the upper frame of the door.

9) When a blind person enters a restaurant without a guide, they will definitely appreciate help finding a coat hanger and a free seat. They can handle the food themselves, it suffices to tell them how the food is arranged on the plate. They will also appreciate information about what is on the table (glass of water, vase, ash-tray etc.) and who is sitting at the table.

10) When you accompany a blind person for a longer time, describe the main features of the surroundings, the furniture in the room and people who are around. In the description, you don't have to avoid optical impressions and colours.

Some blind people use a **guide dog** as their everyday guide which helps them orient themselves in terrain (after leaving the safe area of their flat), move safely both outdoors and indoors, in public transport, natural environment and cultural venues (unlike assistance dogs, who primarily help at home). The guide dog is trained to accompany a blind person along known routes, lead them out of confusing situations and around various obstacles (e.g. puddles, excavations, dustbins, people).

The training of a guide dog is focused on mastery of many skills, which, in addition to basic commands, also include finding a pedestrian crossing, doorways, up and down stairs, turning left or right, navigating obstacles, recognizing and avoiding spaces that the handler would not be able

to fit through alongside the guide dog (e.g. in a crowd of people), slowing down at bumps on the sidewalk, fetching dropped items (that is why guide dogs wear no muzzle when in public transport). The guide dog learns the route but it is the human who does the directing. For example, the dog stops at the main entrances to the building, at pedestrian crossings, at the bottom or top of stairs and awaits the next command. The blind and their guide dog learn new routes with the help of an instructor or some other sighted person. The blind accompanied by their guide dog are allowed to enter shops, restaurants, all types of schools, educational and medical facilities, offices and all cultural and sports amenities (in the Czech Republic, guide dog is regarded as a legally approved assistive aid). In the Czech Republic, the rigorous training of guide dogs, not only those for visually impaired people, which will enable them to return to or improve the quality of their active life, education or involvement in the work process and enhances their self-sufficiency and independence, self-confidence, freedom and safety, is performed by the Prague training centre *Helpes: Centrum výcviku psů pro postižené* (for more details, see *Vodicí psi pro osoby se zrakovým postižením* 2018) or by the Brno association *Vodicí pes* and its training school *Škola pro výcvik vodicích psů* (*Škola pro výcvik vodicích psů*, 2018).

+ Tips and recommendations: **The etiquette for interacting with blind people who are guided by a guide dog** (borrowed from Krejčíková 2009):

1) Never distract a guide dog while it is working. You should not demand its attention by petting, calling, whistling or otherwise. It makes the dog very difficult to work and to concentrate.

2) Don't touch or pet a guide dog without the owner's knowledge, even with good intentions. It is polite to approach the person first and to ask for their consent.

3) Don't call a guide dog to you. The irresistible urge to communicate should be rather focused on the owner.

4) Don't offer treats or food to the dog without the owner's knowledge. Fitness and health are the basis for its long life and work.

5) If you want to help a blind person who is being guided by a guide dog, you should always approach the person first and ask if they need your help. Don't be offended if they say no.

6) When you help a blind person, do not manipulate the dog, always talk to the person, not the dog, and be verbally descriptive about what you are doing.

7) When you walk down the street with your own dog, never allow it to harass, sniff or otherwise distract a working guide dog.

8) When you pass by a guide dog with a blind person, always keep your own dog on a leash.

9) When you board a public transport vehicle with your own dog, you should always give priority to a person with a guide dog.

10) Allow the guide dog to be seated in a public transport vehicle and provide for a suitable place.

4. Parameters of an inclusive museum for blind visitors

The fundamental difference between a **socially purposeful museum** (Sandell 2007; Dodd 2015) and a traditional museum is that the former one goes beyond the scope of its crucial professional activities related to collections and actively encourages the visitors to assume their own role in society, within communities, and becomes involved in collaborative partnerships with other organizations. It seeks to achieve its aims both within and beyond the cultural sector, promotes progressive social values and makes efforts to be a place where various differences – cultural, sexual, health-related, ethnical etc. – are accepted and human life and culture are explored in all their richness. Such a participatory museum (Simon 2010) has the following main characteristics:

- 1) it is a vibrant, lively forum and a site for dialogue and debate, meeting, exploring and developing ideas about the world – it is not remote from society, but is part of people's everyday lives;
- 2) it still pursues its mission and is engaged in essential museum activities – collection building, documentation, exhibition and interpretation – but they are done with a purpose that directly relates to its position within society, in real time and space;
- 3) knowledge is not something that can only be created by experts, academics and museum curators;
- 4) it promotes lifelong and holistic (complex) approaches to learning;
- 5) it nurtures participatory and co-creative practice (active participation) and invites communities to share in the process (the relationship with audiences is mutual, based on interaction);
- 6) visitors are active agents in their own learning, not only passive receivers of knowledge bestowed by the museum;
- 7) the museum appeals to a wide range of people and the audiences reflect the social diversity (they include people of different ages, sexes, education background, life experience, cultures, religions, sexuality and disability) – its relationship to individuals and communities outside its walls is central to its approach (cf. Pinnoy 2017, pp. 70–71).

When considering the visitors with special educational needs and health-related (or other) disabilities, focus is laid on the so-called **inclusive museum** (Cole and Lott 2019; cf. Jagošová 2014). It is based on a post-modern concept of the museum as an open place for meeting and dialogue and promotes an indiscriminate open access of all visitors to culture and education. An inclusive museum understands its audiences as a wide range of individuals; certain limitations, e.g. the health-related disabilities, are not considered a handicap but rather otherness, which is inherent in every human being in its originality. This approach then implies that an inclusive museum does not want to create separate products (exhibitions, educational programmes etc.) for a specific group of people, e.g. blind visitors, or to distinguish them somehow from the others. On the contrary, it strives to set some basic conditions or regulations, i.e. provide for the legally supported (in the Czech Republic following the Act No. 122/2000 Coll. on the protection of museum collections) so-called **accessibility standards** (e.g. physical, sensory, intellectual, temporal, economic, psychological and social accessibility), thanks to which the museum can be made accessible to the widest possible audience. These standards then enable to develop educational specifics and didactic approaches according to special needs of individual target groups of audiences. In the case

of blind visitors, the first step is to provide them with physical access to the museum and give them the possibility of sensory perception and learning through compensatory senses.

4.1 Museum without barriers

Discussion has been held on the so-called **debarriering of museums**, particularly in connection with taking measures for the external and internal physical accessibility, or removal of existing barriers which hinder or significantly complicate the accessibility. Considering the blind visitors, it is necessary to concentrate on whether at all and how (un)easy it is to access the museum building (including the transport accessibility) and subsequently move inside the building (e.g. accessibility of the ticket office and information kiosk) and in exhibition rooms. Debarriering is mainly desirable in historical buildings or other architectural structures which were originally built for some purpose other than museum building (architectonic barriers and interior layout). If the building and the entrance door are accessed e.g. through a staircase, it is necessary to additionally install an **access ramp** (very important orientation aids for persons with residual vision are reflective paints on stairs, glass panels etc.). If the independent mobility of blind people in a museum is contemplated, it is necessary to consider well the overall concept of navigation throughout the building and to employ a system of guiding lines. The indoor mobility and the access to exhibitions are facilitated by oversized and clear corridors without any obstacles. The movement between storeys, particularly in blind corners or dangerous areas (e.g. spiral or helical staircases with different step heights or with an uneven surface), is greatly facilitated by the installation of a **lift**. In addition to different floor surfaces or special mouldings installed on the floor, guiding lines are also formed by carpets situated in the direction of movement through the exhibition and above all by the concept of the distribution of exhibition panels, tables and handrails in the exhibition (cf. Prelovská and Eliašová 2020, p. 83).

+ Important: **External and internal physical accessibility of museums**

Under physical accessibility we understand the optimal condition when all visitors can access a museum building and its indoor space independently. Even if it is impossible to remove all barriers, the negative factors, affecting or completely hindering the access, should be at least reduced.

External physical accessibility (i.e. surroundings of the museum) includes the orientation in terrain and access roads, which are intended to direct the visitors safely to the entrance. The museum building itself is associated with installation of adequate access ramps, stair lifts etc., optimal design of the entrance door and entrance hall of the museum, including an appropriate spatial arrangement and furniture.

Internal physical accessibility is mainly related to orientation in the interior space (distinction of individual floors, use of various colours and materials for walls and floors, use of auditory and tactile elements), as well as to an optimal dealing with unevenness of floors and storeys, and other inevitable elements like lifts, sitting rest areas, and the use of safe and comfortable materials to avoid potential injuries. Other important factors are lighting, heating, crisis management and evacuation plans for any type of danger. Accessibility shall be provided to all visitors with special needs



Fig. 4: Barrier-free design of the South Bohemian Museum in České Budějovice, nominated for the Mosty (2014) award for making museum collections accessible to people with disabilities, and for special programmes for visually, audibly and mentally impaired visitors; South Bohemian Museum in České Budějovice, Czech Republic; Photo: Helena Motyčková

– visually impaired persons will primarily use suitably located Braille labels, tactile exhibits, acoustic elements, special tactile programmes, adequately modified toilets. The above-mentioned steps, together with a well-trained museum staff, represent a prerequisite for the realization of educational services, which are expected by the museum visitors (*Základy muzejní pedagogiky: Studijní texty* 2014, pp. 41–42)

Museums and museum presentations should also be **accessible for sensory perception**. In other words, all information should be available for perception through as many as possible senses. This provision helps to reduce potential inaccuracies, misinterpretations or misunderstandings. Knowing how visitors use the museum services is crucial to finding ways of how to make their visit pleasant and inspiring. The aspect of sensory accessibility is most related to the inner space of a museum and the overall concept of its permanent and temporary exhibitions (including the related educational activities), which should enable the visitors an **intellectual orientation** (in things being perceived and learned in the museum) and physical orientation (where these processes are taking place). The sensory accessibility of information is of crucial importance for blind visitors as regards the museum presentation and education. This is tightly connected with the requirement that a mu-

seum which is open to the public should pay attention not only to a generally good accessibility, but to the same extent also to its own well-trained and **responsive staff**. Museum educator is a member of the team who should be best educated in this field to provide basic information and instructions to the other museum employees, above all the “front-liners” like ticket sellers, cloakroom attendants, keepers/custodians, guides (mainly the principles of orientation and mobility of blind visitors, appropriate methods of communication, provision of help or assistance during a museum tour and relevant information). An inclusive museum offers in its interior e.g. the information about the museum, its collections and exhibitions, comfortable facilities and help for blind people with planning and organizing their museum tour. In the exhibition rooms, adequate space is provided e.g. for introductory and summarizing information about a permanent or temporary exhibition built on a logical conceptual frame, and the concept of exhibitions gives the audiences an opportunity to think by themselves, to employ emotions and social contacts, to have a rest and refreshment. Only by ensuring the general physical and sensory accessibility of a museum is it possible to focus on specifics and special needs of individual groups of visitors and increase both the accessibility and the comfort for audiences (*Základy muzejní pedagogiky: Studijní texty* 2014, pp. 41–42, 46).

In the context of museum exhibitions, it is expected that the information about the institution and its collection objects will be made accessible to all people with disabilities, which includes not only an adequate implementation in museum practice, but also sharing the information on the Internet. The **information accessibility** not only improves the real accessibility of a museum, but also provides the necessary data about it and enables the blind to prepare for a museum tour and for the orientation inside a museum building in advance. This electronic information accessibility is primarily related to the **museum website**, which, from the perspective of blind visitors, should mainly be transparent, well understandable and simply structured (with a site map on the homepage). As regards the content, expected is the basic information about the museum (museum buildings and their locations, internal structure, permanent and temporary exhibitions), organization of the museum’s operation (free entry or advance booking, self-guided or guided tours with exact beginning times etc., including the visitor regulations), opening hours (including the transport accessibility, parking possibilities etc.) and contacts. It may also include a separate tab with information for various groups of special audiences (e.g. more details on accessibility, specialized services).

+ Interesting: **The Blind Friendly Web project**

In the Czech Republic, the Act No. 99/2019 Coll. on accessibility of websites and mobile applications has been used to formulate the requirements of accessibility and interconnection with the remaining information infrastructure, which aim to increase the quality of electronic data, including the websites. The specialized Blind Friendly Web project already started in 2000, during a computer training for visually impaired people in the Czech National Association of Blind and Partially Sighted People, where a considerable inaccessibility and thus unavailability of websites was ascertained. The project therefore systematically focused both on mapping out the websites which are accessible to visually impaired people, and on the elaboration (and continuous updating) of methodical guidelines for website creators (*Blind friendly* 2020–2021).

5. The phenomenon of museums of the blind and its tradition in the Czech Republic

From the perspective of interest in the blind, we can distinguish two main categories of museums which at least partly meet the characteristics of an inclusive and participatory museum: the museums for the blind and museums dedicated to the life and culture of the blind. The museums or specialized museum exhibitions, whose concept, exhibition elements and installation design are adapted to the needs of blind visitors, are mainly referred to as tactile exhibitions or museums with hands-on elements. Other museums are directly specialized in the community of blind people in their scientific, collection-building and presentation activities and their target audiences may be both the majority society and the blind people themselves (or their presentation activities are accessible to both of these groups). These specialized institutions are also called museums of the blind.

Museums of the blind collect and store, to a greater or smaller extent, special tools and archival documents which demonstrate the education, life, work and culture of the blind and partially sighted children and adults in various countries. The collections usually comprise a set of everyday tools for the blind and severely visually impaired people, teaching aids which were often made by the teachers in individual institutes and later schools for the blind, and books printed in various types of the relief Latin script or in Braille. Several museums are engaged in collecting art works by blind artists, sports awards, or in acquiring or creating models of various world-famous monuments and buildings.

In this chapter, we will take a look at the tradition and development of museums dedicated to the life and culture of the blind in the Czech Republic and we will also give examples of several contemporary museums of the blind in the international context. Their list gives an insight into the varied spectrum of institutions documenting the life, education and culture of the blind rather than an exhaustive overview; included are mainly institutions, where the personal experience from their visit could be reflected (more details in Hluší 2013).reflektovat osobní zkušenost z jejich návštěvy (více Hluší 2013).

5.1 Development of museums of the blind in the Czech Republic

The present-day specialized department of the Technical Museum in Brno, documenting the history of tools and aids for the blind, is a successor of the **Josef Zeman's Museum of the Blind** in Prague, which was founded at the Institute for the Blind in Loretánská Street in the Pohořelec district (nowadays part of Hradčany district) in 1935. Its founder, **Josef Zeman** (1867–1961), worked as an inspector at the then Ministry of Education. He and his colleagues collected various aids and tools for the blind and partially sighted people not only from the Czech lands, but also from abroad. The collection also included an assemblage of items from the bequests of **Karel Emanuel Macan** (1858–1925), a blind composer and founder of a library and printing house for the blind in Prague (for more details, see *Tyflopedický lexikon jmenný* 2006). These aids and tools were displayed in an exhibition of prints for the blind in Prague in 1935. Since some of these aids

were left in Prague, Josef Zeman decided to establish the Society of the Museum of the Blind, which later encompassed the Josef Zeman's Museum of the Blind (Hluší 2013).

This collection was an inspiration for the pre-eminent Moravian typhlo-pedagogue **Josef Smýkal** (1926–2017). The first two assistive aids collected by him were a Prague slate for writing Braille and a Klein typewriter for writing the relief Latin script. He managed to establish a museum dedicated to the life and culture of the blind in 1992. The collection was displayed in the newly renovated premises of the Josef Chaloupka Foundation House in Brno, which the poet bequeathed to the blind and where the museum has performed its activities until 2000. The number of collection items was constantly growing and the capacity of the rooms gradually became insufficient. The Czech



Fig. 5: Technical Museum in Brno, Czech Republic, permanent exhibition Culture of the Blind; Photo: Eva Řezáčová

Blind United, an association of the blind and partially sighted people in the Czech Republic, made an arrangement with the Technical Museum in Brno, which offered adequate spaces and auspices to their activities. The **Museum of the Blind** was included in the museum's structure as one of its departments in September 2000. The unique collections are currently presented in a separate permanent display titled Culture of the Blind. The **Department of Documentation of the History of Tools and Aids for the Blind at the Technical Museum in Brno** also collaborates with a range of museums, galleries and other institutions, which organize tactile exhibitions and occupy themselves with the issues of severely visually impaired people (*Kultura nevidomých* [2020]).

Another specialized institution gradually arose in Prague since the 1970s. The **Museum of the Blind at the Elementary School of Jaroslav Ježek** was founded by the typhlo-pedagogue **Marko Vágner** (1932–2020), who collected various tools related to the life, upbringing, culture and education of the blind. The Institute for the Blind in Hradčany district was already founded in 1807 and the tools and aids, which were often made by nuns or by the teachers of blind pupils themselves, did not move anywhere over the years, so a collection of unique objects arose and gradually grew in the basement of the school building. The museum was inaugurated after the reconstruction of the school in 2010 and the collection was made accessible both to school visitors and to the general public (Hluší 2013; *Škola Jaroslava Ježka* [2020]).

Currently, in addition to the museums specialized in the issues of visually impaired people, other museums in the Czech Republic are also dedicated to this target group. Examples of their activities in this area are given in Chapter 7, dealing with museum exhibitions for blind visitors.

5.2 Museums of the blind abroad

From a global perspective, museums of the blind can be divided according to whether they function as independent museums, or whether their collections are part of an educational or other institution, within which they were established. These museums were founded or their collections were gradually built up within a long period of time (as early as the first half of the 19th century, e.g. the museums in Dresden or Vienna, and in the 1990s, e.g. the museums in Madrid or Brno). Also important is the issue of their accessibility – whether they are open to the general public or only to a limited audience (this may be the case particularly with museums at special schools or other institutions, which, by their very nature, are not open to the general public and are only occasionally available to visitors from beyond their confines).

Independent museums of the blind

First and foremost, the **Louis Braille Museum in Coupvray** is to be mentioned, which is located in the birth house of Louis Braille in north-central France. The museum is documenting the life of the Braille family and the tools, which Louis Braille himself has used in the National Institute for Blind Youth in Paris. An independent museum institution focused on the issues of blind people is, for example, the **Typhlological Museum in Zagreb**, Croatia, which presents its collections



Fig. 6: Museum of Special Education in Levoča – a view of the copper globe made by Viliam Hrabovec; Archive of the Museum of Special Education in Levoča, Slovakia; Photo: Peter Olekšák

(e.g. tools for writing the relief Latin and Braille scripts, wood carved sculptures by blind artists) in several permanent displays and in temporary exhibitions. Apart from the museums directly specialized in the issues of blind people, some more broadly focused museums also exist. In Slovakia, the original museum of the blind became part of the **Museum of Special Education in Levoča**, which collects tools and aids, archival documents and books from various fields of special education as well as models of various buildings from throughout Slovakia. The aids for the blind are represented by a hammered copper globe, which was manufactured by Viliam Hrabovec, a teacher at the institute for the blind in Levoča, and by objects made by blind schoolchildren and by students from the Vocational School for the Blind etc.

Museums of the blind at schools for the blind

An example of a school museum at a school for the blind is the Typhological Museum in Owińska, Poland, with a collection from the beginning of the 20th century, which has been built up over the past few decades (e.g. slates for writing Braille, awards for Polish blind officials, sports awards, various aids for orientation and independent mobility, raised relief maps, mathematics and geometry tools and school textbooks in Braille). Another museum which is part of a school for the blind is the **Museum of the Blind in Vienna**, Austria, which has been storing the aids collected by the first director of the institute for the blind, Johann Wilhelm Klein. Similarly focused extensive collections (tools for writing the relief Latin script and Braille, geographic maps, craft goods and art works by blind artists, extensive library) are stored in the **German Museum of the Blind in Berlin-Steglitz**. Collections containing historical tools and aids, books and archival documents are also found in the **Museum of the Blind in Hannover**, Saxony, or in the **Museum of the Blind in Zollikofen**, Switzerland. The Italian **Museum of the Blind in Milan** with its collection of teaching aids belongs to a boarding school for the blind and the **Museum of the Blind in Florence** is part of an educational centre for the blind, where the collections (teaching aids and toys etc.) have been gradually built up since the founding of the centre. In Russia, the **School Museum at the Boarding School No. 2 in Moscow** (with historical teaching aids, books printed in various types of the relief Latin script, and awards for students in various fields and competitions) or the **School Museum at the Konstantin Karlovich Grot School in Saint Petersburg** with similar collections can be mentioned.

Museums of the blind established by the associations of the blind

These museums have been established by the national organizations of blind people or other specialized associations. An example may be the **Valentin Haüy Museum in Paris** at the Valentin Haüy Association (with many prints in various types of the relief Latin script and with special tools used by Louis Braille and by the teachers of the National Institute for Blind Youth in Paris). The **Typhological Museum in Madrid** at the Spanish National Organization of the Blind (ONCE) is exceptional in both its extent and its collections. In addition to the aids for education of the blind and deaf-blind, it also owns models of world-famous monuments and buildings (Eiffel Tower, Saint Basil's Cathedral or the Leaning Tower of Pisa). The **Central Museum of the Blind in Moscow**,

which brings together collections from throughout Russia (special aids, archival documents, books printed in various types of the relief Latin script and Russian alphabet, sports awards and art works by blind artists), and the **Museum of the Blind in Saint Petersburg**, which rather stores regional collections, are both operated under the auspices of the All-Russia Association of the Blind. The Belarusian Association of the Visually Disabled (BELTIZ) operates the **Museum of the Blind in Minsk**, which documents the aids for writing Braille, collections of art and handicrafts, sports awards and honours of blind presidents of the organization from its founding until today.

Museums of the blind established at libraries

Other museums can exist as a part of public or specialized libraries for the blind. An example is the Museum of the Blind in Warsaw, which is operated by the Polish Association of the Blind and is part of the **Library for the Blind in Warsaw**. This museum, unlike the others, is not focused on the tools of daily use and teaching aids, but on collecting the works by blind artists. Two other museums, building up collections of Orthodox icons, tactile books, toys for blind children and works by blind artists, are located in the **Russian State Library for the Blind in Moscow** and in the **State Library for the Blind in Saint Petersburg**.

6. Blind museum visitors: cognitive and spatial orientation and mobility

The ability to use the acquired individual skills, which were described in previous chapters, as well as the interest and motivation of blind people to visit museums play a significant role in moving around a museum and in ensuring the physical, intellectual and sensory accessibility of both the museum itself and, above all, its interior spaces and exhibitions. This is also closely related to whether the blind visitors already know a particular museum or whether it is their first visit there, whether they come **alone** or with an **own guide**, either a person or a guide dog, or whether they prefer to be **guided by a museum worker** right on the spot.

Considering the “debarriering” of a museum, it is also necessary to bear in mind the **removal of communication barriers** (and their prevention). Before visiting a museum, especially if it shall be one of the first visits there, blind people need to study basic information in order to properly assess what the journey to the museum and the access to the building (transport, obstacles on the route) will demand, how to plan this visit with regard to time schedule and organization (e.g. whether or not to announce an individual visit to the museum in advance; this is a matter of course for the groups of blind visitors) and whether to go to the museum alone or with a guide (the training for an independent trip is more likely in the case of interest in a repeated museum visit). Potential blind museum visitors expect to acquire the crucial information in a comprehensible, well organized and accessible form on the museum website.

6.1 Museum website accessible to blind users

The problem of website accessibility is very extensive, complicated and evolves very dynamically, particularly from a technological point of view (in detail, see *Blind friendly 2020–2021*). At this point, we will therefore add especially the basic principles of museum websites, which should be checked out in the context of the blind (but also various other groups of visitors with special needs) and directed towards a “**blind friendly museum website**”. This problem was treated in detail by Radek Pavlíček (2011) in his article *15 cest k lepší přístupnosti vašeho webu* (15 ways of how to make your website more accessible), including practical examples (in *Blind friendly 2020–2021*; borrowed and modified here):

1) Create a consistent navigation and structure of the website (individual page elements are to be placed at the same places and clearly separated from each other, so that all pages of the same website have a unified structure as regards the code and visual design).

2) The page content is to be structured with the help of headings (headings are the most important navigation elements of a website and, if apposite, well understandable and properly placed at the beginning of every section of a web page, they provide for an easier and faster page navigation for blind users).

3) Use lists where necessary (thanks to information on structure, the users more easily recognize where a list begins and where it ends and which items belong together, they orient themselves quickly within the scope of the list and, thanks to nesting, they also understand dependencies between individual items).

4) Provide for a sufficient colour contrast between the text and the background and do not use a pattern on the background that reduces the readability of the text (partially sighted users will appreciate this), but don't rely on visual resolution only through colours (apart from visual limitations, this also applies to technical parameters – not all devices support colour display and layout in compliance with the standard display in the browser).

5) Set a sufficient default font size and allow it to be enlarged (apart from the visually impaired, e.g. seniors will also appreciate it).

6) Assign appropriate labels to form elements and formulate alt texts for images with semantic content (add an adequate text description to the images; for images that serve only as a link, instead of their description, specify the destination address to which the link leads).

7) Create tables so that they make sense when read row by row, and have row and column headings properly marked.

8) Put the documents on the website in an accessible format (ideally, offer the document in several different formats so that the users can choose according to their needs and possibilities).

9) Ensure that the web page can be navigated using a keyboard (when navigating websites, blind users cannot use any device other than keyboard, e.g. a mouse).

10) Less is often more (adding a number of elements or functions can complicate the orientation on a website, especially in the case of blind users – e.g. information is more difficult to find, web design is unintuitive).

11) The link texts must be concise enough (so that the user can easily understand where the link leads and what to expect on the target page; if the link leads to a document type other than html, it is recommended to add information about the size and type of the target file to the link text).

12) Write clearly (to make the website well understandable for the user, focus on only one topic on each page and write texts using the inverted pyramid structure – i.e. put the summary in the first paragraph on top, because it facilitates orientation and the users can quickly find out whether the page has what they are looking for, which will reduce the risk of their frustration; don't forget to explain abbreviations and technical terms and pay attention to linguistic correctness).

As regards the **content of the museum website**, blind visitors appreciate the following information conveyed in written or spoken form:

1) description of the way to the museum starting from good orientation cues (e.g. public transport stop, car park);

2) details of the museum building and its surroundings – notice of useful information, important orientation cues, description and specification of the barrier-free accessibility level of the museum;

3) internal division of the building (and the level of internal accessibility) into individual storeys, including a detailed description of rooms on the entrance floor and facilities which blind visitors can use for themselves and for their guide dogs;

4) specification of provided services and spatial orientation – detailed description of what and where is situated, i.e. ticket office, cloakroom, refreshment, accessible toilet, orientation of the staircase inside the building, location of the lift (optimally a “talking” one, with Braille marking on individual buttons of the control panel), entrance to the permanent/temporary exhibition, presence or absence of an orientation system for blind visitors, as well as basic organizational instructions for a museum visit (e.g. self-guided or guided tours, other staff in exhibitions), an excerpt from key instructions and information stipulated in the visitor regulations (and a reference to the full version of detailed visitor regulations), an overview of currently offered exhibitions with additional comments containing necessary information for blind visitors;

5) museum guide (it can be available e.g. as a mobile app to download from the museum website), providing basic information about the museum – i.e. about permanent exhibitions and their structure inside the building, about selected significant exhibits, about other facilities administered by the museum, and other important information; or directly audio recordings of permanent and temporary exhibitions.

For a blind person, it is best to prepare for a museum visit in advance by studying the above-mentioned information beforehand at home to get an as accurate as possible idea of how to organize well the museum visit and which potential complication or obstacles can be expected. The audio description of the way to the museum and the audio museum guide, if available, are also appreciated by blind visitors during the real museum visit. It is expected as a matter of course that the museum is prepared for the movement of blind visitors accompanied by a guide dog inside the building, which should be reflected in the text of **visitor regulations**. It should contain at least a brief notice that pets and other animals are not allowed to enter the museum but guide dogs are exempted from the rule.

6.2 Indoor mobility of blind museum visitors

According to the principles of an inclusive museum and the key accessibility standards described in the previous chapter, the barrier-free access to a museum building and to the surrounding area, including the access roads, is essential for blind visitors. At the moment when a museum is able to provide access to the building for blind visitors, it is necessary to think about the internal spatial arrangement and remove potential obstacles where possible. Blind visitors come to the museum in groups or individually. In **organized groups** we suppose that their leader (teacher, organizer) will announce the visit in advance to secure the services of a museum worker who will guide the group during their museum tour. This leader, as a person familiar with the composition of the group, informs the museum worker in more detail about the members of the group and their special needs. During a group visit, it is also necessary to ask about the number of incoming **companions of the blind**, or, depending on the specifics of the museum, propose a suitable solution to the group leader. In museum buildings with a complicated architectural design, causing a safety risk for the mobility of the blind (e.g. due to uneven floors, obstacles in the space, complicated movement between storeys, spiral staircase, narrow passages or low ceilings, etc.), it may also be recommended that each blind member of the group be provided with an own guide. In the case of **individual blind visitors** we can expect multiple variants of how they will arrive in the museum – accompanied by an own guide, accompanied by a guide dog, or alone (probably always using a white cane). In this context, it is necessary that the museum staff be thinking ahead about the “operational” issues of how to solve the provision of a museum guide if a blind person requests one – which of the employees will take on this role and how they should be trained for this activity.

The **basic general principles of how to offer help or support to a blind person**, which are also very well applicable in museum practice, have already been addressed in a number of various different manuals. To those readers for whom this issue is currently still unknown, we highly recommend the website of the TyfloCentrum association, regional centre Tyfloservis Brno, and a brief publication in Czech language *Ne tak, ale tak: Příručka správného kontaktu s nevidomými* (van Dyck 2003–2019; cf. Cerha 1991) available on this website, which is intended for sighted people and provides information and advice on basic topics such as crossing the street, using means of transport, instructions on how to guide a blind person, how to show a place to sit, shopping. It also addresses the main misdeeds that the uneducated public unintentionally commits, such as the use of the words “here” and “there”, shyness about supposedly taboo words, it clarifies when and how to describe, but also how to effectively offer help but not overstep the mark of the blind person’s interest in its use.

+ Important: How to guide a blind visitor around a museum

Let’s briefly recall the main principles that we will put to good use in the interior of a museum, when we offer a blind visitor help to move between individual museum halls or storeys:

1) Have the blind person hold your left or right arm, they themselves will tell you what they are more comfortable with.

2) You, as a guide, have the blind person walk a step behind you and have the hand that they are holding slightly bent to alert them, for example, that a narrow space is coming up.

3) If you approach the stairs, stop and bring the blind person to the railing so they can grab it with their free hand.

4) If you have an exhibition outside the main building and you have to go up or down stairs, you should stop in front of the stairs, inform the blind person whether they go up or down, and when you reach the top or bottom of the staircase, stop to let them catch up and let the blind person know.

5) If the blind person has an own guide with them, he or she will do everything necessary.

In many cases, blind visitors will come to the museum accompanied by a specially trained **guide dog**. The dog, on the one hand, must be able to obey and respect their handler who gives them commands to navigate the surrounding space (e.g. to find the entrance door to the museum, inner staircase etc.), but, on the other hand, they must be able to independently solve problems and make decisions if they recognize a potentially hazardous situation. In a building which is easy to navigate, so that a blind visitor is able to move around unaccompanied by another person, it is possible to install basic audio information in the entrance area (optimally by placing an acoustic orientation beacon above the entrance to the museum, or in the form of an audio recording available in some other way, or through an employee of the museum) which, for example, directs a blind person to the ticket office and to a relief plan of the entrance floor (with good markings of the access to exhibitions or to the staircase to other floors) and explains how to obtain information continuously during



Fig. 7: Guide dogs in the Technical Museum in Brno; Technical Museum in Brno, Czech Republic; Photo: Eva Řezáčová

the museum tour. In this case, the blind persons accompanied by a guide dog can combine their own commands with additional information available through touch or hearing. It can be, for example, an information in Braille on the backside of the right staircase handrail, an audio recording that can be activated through a mobile app or through the museum audio guide or some other way. If a blind person visits a particular museum for the very first time, they will probably appreciate the **assistance of a museum worker** at least to show them the way to a selected exhibition, or, more continuously, to guide them through the entire exhibition, unless it is designed as a tactile exhibition, fully accessible for orientation and sensory perception through touch and hearing.

+ Important: **Guide dogs in museums**

There is no need to worry about the presence of a guide dog in the museum. They are specially trained to guide and assist blind people and the guide dog breeds are chosen for their calm temperament and trainability. While in a museum, the guide dog does not make noise, does not run around, does not touch exhibits and showcases (Jančo [2013]). They should be allowed to enter all premises accessible to their handler, which should be reflected both in the visitor regulations and in their practical application. It is sufficient for the museum to take a friendly and accommodating approach to the guide dog's needs – e.g. provide a bowl of water, a designated area where the guide dog can rest, direct where the guide dog can relieve itself, etc. At the same time, it is necessary not to pet, feed, call or otherwise distract the dog from its work.

+ Interesting: **The Guide and Assistance Dogs Welcome sticker**

Although (not only) in the Czech Republic it is mandatory to allow entry for guide and assistance dogs, not all operators of shops, restaurants, sports or medical facilities and other facilities are aware of this obligation. Since 2017, a special sticker draws attention to the issue of people with physical or sensory disabilities entering various spaces, including with guide or assistance dogs. Stickers with the image of a guide and assistance dog with the inscription "GUIDE AND ASSISTANCE DOG WELCOME" are intended to be posted on the entrance doors of shops, restaurants, cafés, various establishments, offices, educational and medical facilities and cultural institutions. The project aims to promote dogs with special training and above all to draw attention to the fact that these dogs can not only enter the given institution, but are also welcome there. Another goal is to help break down barriers and prejudices between people with guide and assistance dogs and the rest of the public. The project, which is also open to other cities in the Czech Republic, originated in Brno and is coordinated by the Health Department of the Brno City Municipality and the Guide Dog School of Milan Dvořák from Brno (*Nálepka – Vítáme vodícího a asistenčního psa 2009–2020*).

7. Specifics of temporary and permanent museum exhibitions for blind visitors

A number of specifics must be taken into account for the inclusion of people with visual impairments in museum activities. They are generally based on the accessibility of the museum building and its interior spaces (from the entrance area through facilities for visitors to the exhibition rooms), the level of barrier-free accessibility or removal of physical barriers where possible.

The **basic principles of an optimal access to permanent and temporary exhibitions for blind and partially sighted visitors** include the provision of the following measures (after Hasaj 2015 in Prelovská and Eliašová 2020, p. 83):

- 1) barrier-free access to exhibits and the use of a natural or artificial guiding line;
- 2) a relief map of the exhibition spaces, located at the entrance, supplemented with a description of the exhibition and Braille marking of individual exhibits; in the case of visiting a specific museum facility (e.g. museums located in historical monuments, castles, mansions, architecturally unique buildings), creation of a 3D model of the building (so that the blind visitor can get an idea of the whole);
- 3) exhibit labels in Braille and in large print;
- 4) choice of characteristic exhibits and manufacture of their tactile copies;
- 5) production of an exhibition catalogue including the description of exhibits and relief images of selected objects;
- 6) training of museum workers for communication with blind or visually impaired visitors.

The key inclusive approach is thus to facilitate the spatial orientation of blind visitors and the overall concept and installation of the exhibition in such a way as to ensure **personal mobility with the greatest possible independence for persons with disabilities** – e.g. guiding lines (mouldings) on the floors in the interior, a suitable exhibition equipment and, above all, a clear linear arrangement of the installed exhibition. The basic principles of sensory accessibility of temporary and permanent exhibitions for visitors with various visual impairments include the provision of contrast between exhibits and the environment (or between the text and background), increased light intensity and elimination of glare. In many cases (but not with severe visual impairments) a larger font size also helps. A suitable exhibition concept is one that allows the blind visitor to learn through other senses, i.e. the possibility to learn by touch (hands-on approach), using, for example, multiples of exhibited objects, substitutes, possibly relief or 3D models of exhibits with Braille labels, as well as various mock-ups and other didactic aids that can compensate a blind visitor's visual perception in an appropriate way. Due to complexity of tactile exhibits, it is necessary to consider their quantity in an exhibition, of course with regard to its overall extent; it is generally recommended to include within 30 exhibits, preferably less. It is essential that the selected tactile exhibit meets the didactic requirements - i.e. that it is closely connected with the theme of the exhibition and its sub-parts, that it is representative (to show the typical features that we want to convey to the visitor) and understandable, suitable for tactile cognition (in terms of suitability of the material, from which it is made and the method of surface finish used, and also in terms of a size that would allow a blind visitor to grasp it) and safe for visitors (so that they are not at risk of injury).

+ Tips and recommendations: **How to help blind visitors orient themselves in an exhibition**

First of all, we should describe in detail the exhibition we are in, because not all visually impaired people have the right idea about it. If you have a permanent exhibition that is customized so that these visitors can navigate it all by themselves, explain to them what they can explore in the exhibition by touch. The tour should start clockwise, i.e. from left to right. Point out the possibility of reading labels, if available in Braille or in large print, so that they can read them themselves according to their own time. Someone from the museum staff should be available to blind visitors (for example, a museum custodian or another designated employee is offered during normal operation) so that they can turn to them with any questions. If the management of your museum will be receptive to the idea of making copies of some of the objects in your exhibitions for the severely visually impaired visitors, that is excellent. Today, they are mostly made with 3D print, from ceramic clay and other materials. Various decorative laces can also be adequately processed today. A number of elements can also be processed in the form of a relief image in 2D.

In addition to the components of the exhibition which are bearers of visual information, the **informational and textual parts**, which should provide knowledge about the theme of the exhibition and individual exhibits, also play an important role. For blind visitors, two basic solutions are preferred, which do not require service by a museum worker – either to convert the prepared text materials into an **audio guide** (which can also be well used by other visitor groups in the museum),



Fig. 8: Creation of labels in Braille on a Braille typesetting machine; Technical Museum in Brno, Czech Republic, permanent exhibition Culture of the Blind; Photo: Eva Rezáčová

or to think (at least in the case of labels or other short-format messages in the exhibition) over the **transcription into Braille**. However, this also has its pitfalls – museums usually are not able to create these labels on their own, and it is also necessary to take into account that not all blind people can read Braille (whether due to not learning tactile reading, little practice in it or an insufficient sensitivity of fingertips for tactile reading).

+ Tips and recommendations: **How to provide for exhibition labels in Braille**

In the Czech Republic, you can contact Eliška Hluší, the head of the Department of Documentation of the History of Tools and Aids for the Blind at the Technical Museum in Brno, who will gladly print the labels and perhaps even an exhibition catalogue in Braille upon request. It is always advisable to first arrange a personal consultation, at which you will agree on the scope of cooperation, and then deliver the prepared materials via e-mail. In order to have enough time for the conversion into Braille and subsequent printing, the preparation of a catalogue requires the delivery of source documents approximately 3–6 months in advance, and the transcription and printing of labels, taking into account the number of exhibits to which they refer, will take at least one month.

The **description of an object in textual form** can be chosen (also with regard to visitors with other forms of visual impairment) as a combination of large print and Braille. For normal print, a high-contrast black-and-white design is expected, using a medium-bold, sans-serif font – e.g. Arial, Verdana, size at least 14 points with 1.5 line spacing, left alignment and uniform spacing between words. It is advisable to place this label or short text in such a way that it is accessible by touch and stably and securely mounted – ideally to the right of the exhibit in either a horizontal (e.g. on a table) or vertical (e.g. on a panel) position. At present, some of the blind visitors have **modern technologies**, and it is therefore possible to consider also some other forms of communicating information than just the tactile way. Labels for exhibits can be provided, for example, by means of QR codes, which the visitor scans with a mobile phone with Internet access (ideally, by securing a Wi-Fi connection in the museum's exhibition rooms and placing the labels on the museum server).

Also, the **exhibits** to which the labels refer should be installed at table height (about 65 cm) and in one and the same guiding line. A functional exhibition respecting the principles of learning with the help of tactile cognition emphasizes the perception of objects and phenomena, sufficient clearness and representativeness, as well as the support of understanding the relationships between these individual components, using the remaining senses, other decipherable stimuli and interpersonal communication. The tactile exhibits should therefore include not only real objects (or their substitutes) as representatives of a certain phenomenon or reality, but also various models, reliefs and typhographics of an adequate didactic value (Prelovská and Eliašová 2020, pp. 83–84).

+ Important: **Specifics of relief aids for the blind in museums**

Didactic aids for the blind (e.g. geographical relief maps, picture books for blind children) cannot be successfully created without basic knowledge of the psychology of tactile perception, degrees of tactile abstractions and physiological and psychological specifics of the process of per-



Fig. 9: Self-help relief modification of the globe to enable tactile perception; Technical Museum in Brno, Czech Republic; Photo: Eva Řezáčová

ception. It should be noted that visual perception is diametrically opposed to tactile perception; touch is the sense of contact and we use it to synthesize space (more details in Smýkal 2018, p. 165). During education, tactile reliefs aim to make the learners familiar with the surrounding world and its representative examples, strengthen spatial perception and generally help the blind in developing their compensatory skills (that is why they are also used in the creation of children's textbooks or spelling books for blind pupils, and are also suitable for the use in museums). When creating the tools (which should be consulted in practice), it is necessary to think about the fact that a positive (i.e. convex) relief line is more accessible for tactile perception and that people with residual vision can also make use of the visual colouring of a relief image. It is always a kind of visual aid in 2D, which differs from the real 3D object in its dimensions, colouring, surface structure and details. The dimensions of a relief image that is intended to be perceived through touch should not exceed the width of two hands (Prelovská and Eliašová 2020, pp. 83–84). In museum practice, blind visitors will certainly appreciate the inclusion of relief floor plans (e.g. the exhibition halls) or side views of objects (e.g. heritage objects) for their better orientation, as well as the use of relief images and 3D models in the exhibition, where didactically appropriate, and strengthening the interconnection of individual tactile elements.



Fig. 10: Tactile architecture models (2002) in the Museum of Special Education in Levoča; Slovakia; private archive of Eliška Hluší; Photo: Zdeněk Hluší

7.1 Tactile exhibitions and tactile pathways

The interlinking of individual accessible elements, providing information and stimuli to the blind (exhibition texts in Braille, audio guides, three-dimensional tactile exhibits, relief images, and other tactile didactic material in the exhibition), into a compact unit aims to direct the visitors to the disclosure of mutual relations and enables them to understand the entire exhibition. This can be achieved with two possible approaches using other senses and exhibition elements – by creating completely specialized, so-called **tactile exhibitions**, or including the so-called **tactile pathways** in a regular exhibition, so that it is also accessible to blind visitors.

A specific place among tactile exhibitions belongs to hapaesthetic exhibitions, favouring the aesthetic aspect. With the so-called **hapaesthetics**, i.e. haptic aesthetics (with reference to the book *Dotýkejte se, prosím! Průvodce hmatovými projekty*, published by Terezie Hradilková and Vladimíra Sýkorová in 1998), we mean a field oriented to the aesthetic value of tactile perception of the blind, where, in addition to the informational value of tactile perception, a significant space is left for the aesthetic experience that is connected with the process of haptic perception (i.e. the object of perception and the inner world of the blind). **Hapaesthetic exhibitions** aim to give blind

visitors the opportunity of experiencing art by touch or to present art objects designed for haptic perception. A **tactile pathway**, on the other hand, makes a regular permanent or temporary exhibition accessible also to blind visitors. This feature consists in arranging the elements of the path in such a way that a blind visitor can experience the exhibition independently, which is enabled by the overall architectural design of the exhibition and its arrangement with a clear direction of movement and employment of guiding lines. Such orientation aids can be represented by tactile strips on tables intended for placing a certain set of exhibits, and other elements that aptly represent the main exhibition concept and are perceptible by touch. The tactile strips are supplemented with Braille labels or a verbal information. An integral part of both the tactile pathway and the tactile exhibition is a responsive, well-trained staff (Michálek and Vondráčková 2015). With both of the above-mentioned variants of tactile arrangement, it is desirable that the preparation and realization of an exhibition or the additional inclusion of tactile elements are made in cooperation with professional institutions and associations that bring together the target audience. The use of tactile exhibits and the **design of tactile exhibitions** should be based on general principles (seen primarily from the perspective of blind visitors):

1) The overall orientation system in the exhibition should be simple, concise and as intuitive as possible for the blind.

2) The elements for blind visitors (or any other special audience groups) should be included as a regular part of the exhibition, not separated into other spaces – this would increase barriers rather than remove them.

3) In the exhibition, we should try to engage as many senses as possible and put the main emphasis on the possibility of tactile cognition, including the related labels (both in Braille and in normal print).

4) Permanent exhibitions should be equipped with an audio guide, or a trained museum worker should be available on site to present the exhibition to the blind.

5) It is important to not forget that all the regular programmes or materials accompanying a permanent or temporary exhibition should be adapted for blind visitors (Rižák 2009, p. 24).

+ Important: **The choice of a suitable tactile exhibit to be displayed**

Objects that are intended to be perceived by touch must be large enough. Very small models are difficult to recognize by touch, too. The size of tactile exhibits must be sufficient for an adequate elaboration of details, which should meet the needs of blind visitors. When we commission the manufacture of a didactic exhibit, we determine the priority elements of its production in order to make the object sufficiently comprehensible to the blind. For example, when the German typhlopedagogue Martin Kunz created depictions of animals, he made them so that their fur was indicated by sprinkled wool crumbs. When he was making maps, he paid attention to individual parts of cities that he himself considered important to show to the blind. We should keep in mind that the more structured an object, the less clear it is for a blind person.

Tactile exhibitions in museum practice work with different ways of making exhibits accessible to blind visitors. In recent years, especially in foreign museums, the area of museum presentation saw an increase in the frequency of using new approaches or technologies, e.g.

conversion of images into a tactile form using special 3D printing technology, or the so-called haptic feedback or simulated feel of 3D models of sculptures from a database, with the possibility to perceive their shape and material (Raková 2017). The origins of making the museums in present-day Czech Republic and their collections accessible date back to the 1980s (Jančo 2013, p. 42); tactile exhibitions in Czech museums began to be more frequent after 1989. Art-oriented exhibitions for blind visitors, looking for ways of how works of art could also speak to the blind, began to be organized by an association of people, later named Hapestetika after a series of exhibitions organized by them. Exhibitions were also accessible to the sighted, who were provided with blinders. With its approach and slogan “Please Touch”, this project also appealed to other institutions (e.g. the National Gallery in Prague joined the collaboration) and influenced other personalities. The exhibitions aimed at the development of specialized techniques and supported the blind in their active artistic creation (e.g. the Okamžik association and the Axman modelling technique) and subsequently also paid attention to tactile exhibition activities (some of the works of blind artists became part of museum collections, e.g. the Collection of Tactile Sculpture in the Regional Gallery of Vysočina in Jihlava) (Raková 2017; Rižák 2009, p. 17). In addition to the **tactile experience of art**, attention was also paid to large exhibition projects focused e.g. on **archaeology**. From the beginning of the 1990s already, we can also find the first tactile exhibitions in the National Museum in Prague (*Doteky pravěku a antiky/Touches of Prehistory and Antiquity, Egypt dotekem/Egypt by touch*), which already used a combination of tactile perceptions – verbal description/tactile label, relief depiction, tactile sensation of the original or a copy of the given collection item and enrichment of the exhibition with a catalogue in Braille and large print, accompanied by tactile illustrations. Later, exhibitions for the general public also began to appear in museums, conveying information about the life of people with disabilities, such as the exhibition by the Moravian Museum *Jak se žije s handicapem, aneb Poznat znamení porozumět* (How to live with a handicap, or To know means to understand) in 2008 (Jančo 2013, pp. 42–43). The trend of making culture accessible to the blind in the form of accessible routes has gradually spread to historical buildings, botanical and zoological gardens, and sightseeing tours in public spaces, focused, for example, on the architecture of historical buildings and using plastic reliefs or models of historical buildings and parts of cities (Rižák 2009, pp. 17–23). The implementation of hands-on elements in museum exhibitions is currently relatively widespread (at least as a common element of increasing the interactivity of exhibitions) and making exhibitions accessible to blind visitors has a growing tendency (especially in connection with the creation of new museum exhibitions). In recent years, in addition to the use of tactile elements or pathways in temporary and permanent exhibitions, attention has also been drawn to the reflection of educational practice and experiences with blind visitors at exhibitions and special programmes (e.g. Ereemeeva 2020; cf. *Muzeum bez bariér* 2017), both inside and outside museums (e.g. presentation of collections of living plants, cf. Skružná 2019).

8. Blind visitors in museum education

Following the basic principles of designing an exhibition accessible to visitors with severe visual impairment, it is necessary to consider the optimisation of activities accompanying the exhibition, didactic aids or educational programmes, so that the limitation or impossibility of visual cognition is compensated by other adequate activities.

The basic prerequisite of professional behaviour is **compliance with the general principles of communication with visually impaired people**. It is expected that the **museum educator** (or some other employee who is in charge of this agenda in the museum) has at least general theoretical knowledge of the specifics of educating blind visitors and practical knowledge of at least the basic principles of communication with blind visitors when guiding them through an exhibition, and is willing to further educate oneself in this area. The museum educator is therefore a person who also has the mandate to train other museum workers in the given institution, especially the so-called front-liners, who may come into contact with blind visitors most frequently. It can be a training during which the attendants are provided with verbal information, practical demonstrations and supporting texts. In the Czech Republic, for example, the National Museum in Prague has elaborated such a manual (see *Základy komunikace s návštěvníky se speciálními potřebami: pro pracovníky dozoru a pracovníky pokladen 2020*) for its employees. On the website of the Centre for the Presentation of Cultural Heritage, we can also find the information portal *Muzeum bez bariér* (Museum without Barriers), providing the museum workers with examples of good practice, materials and links to various other sources, conferences and workshops, which in recent years have been organized very frequently in relation to various groups of special audiences in Czech museums.

+ Important: How to avoid insecurity when communicating with a blind visitor

For beginners, it is mainly recommended to act naturally. When starting communication, in addition to the greeting, we also say our name, even if we are not meeting for the first time (so that the blind person can get their bearings quickly). If necessary, it is possible to touch them gently on the forearm when greeting. We replace all our gestures and facial expressions with a verbal description (e.g. "I am extending my hand out to you"). If we want to offer help to a blind person, we must always ask them whether at all and how they would like to be assisted. When offering assistance to a blind person, it is necessary to verbally comment in advance, always let the blind person walk on the safer side and draw attention to possible obstacles. The blind person holds our arm and walks a half step behind us. When talking, we maintain eye contact and address the blind visitor directly (not through their companion, if present). In the exhibition, we avoid inaccurate orientation instructions (we don't say "there" or "on the right", but "on your right"). When communicating, we need not to be afraid of using vision-related words (e.g. "you can see here, take a look at"), which are commonly used by blind people, too. Words related to blindness are, of course, okay as well. Visual impairment is not a taboo for the visually impaired, it is their reality (*Muzejní edukátor: Studijní materiál* [2019], pp. 232–233; Prelovská and Eliašová 2020, p. 84; Michálek and Vondráčková 2015).

8.1 The blind as museum learners

It is necessary to set aside **enough time** for the implementation of an educational programme for the blind. Due to visual impairment, inaccurate, incomplete or distorted ideas can arise. Sufficient space is therefore needed for explanations, help in creating relations and answering questions. The key to successful education is not to rush visitors when sensing the exhibits by touch and possibly by sight (let's not forget that some blind people are able to distinguish between light and dark and can therefore capture e.g. the outlines of an object) and at the same time it is advisable to choose a sober number of tactile exhibits. Tactile cognition requires a strong controlled attention and is very exhausting for a blind visitor due to its demands on concentration, necessary precise familiarization with an object, reflection of previous experiences and subsequent interpretation. The interaction with the blind follows all of the generally applicable didactic principles. In accordance with the principle of an individual approach to learners, it is necessary to consider to which extent the **methods of direct and mediated learning** should be used in museums and how should be their appropriate proportional representation (for this, it is necessary to obtain more



Fig. 11: Tactile model cars with Braille labels in the permanent exhibition of the Technical Museum Tatra in Kopřivnice, Czech Republic; private archive of Lucie Jagošová



Fig. 12: Relief image – longitudinal section through an old fire pump; Technical Museum in Brno, Czech Republic; Photo: Eva Řezáčová



Fig. 13: The Pražský hrad (Prague Castle) catalogue in Braille; Technical Museum in Brno, Czech Republic; Photo: Eva Řezáčová

detailed information about particular blind visitors). In people who are blind from birth, we cannot expect visual imagination. On the other hand, visual imagination of visitors who lost their sight later (around the age of 7 or later) can be used for education and can be further strengthened and enriched with the help of other senses. Following the principle of demonstrativeness, we use both the residual eyesight and a selection of **sufficiently representative examples**, together with the corresponding explanation in speech and in the selection of tactile exhibits. It is also appropriate to use the visitor's ability to abstract both when explaining the topic and, for example, in practical and creative activities (Smykal 2018, p. 144).

If the blind visitor does not come as an individual, but in an organized group with other blind or severely visually impaired persons, then the organization of the entire museum tour, methods of communication and interaction of the museum educator with visitors, spatial mobility, realization of the educational programme, and the total time spent in the museum are significantly influenced by the **number of accompanying persons**. Also important is whether the blind are visiting a particular museum building for the first time, how familiar, close and comprehensible the theme of the exhibition/programme is to them, how far the exhibition design meets their special needs and to what extent they can actively participate in the learning process. While moving in the exhibition halls, it is always necessary to beware of obstacles.

In educational programmes involving persons with severe vision disorders, the **temporal limitation of short-distance work** must be taken into account. A large proportion of severely visually impaired people have various residual vision and their ability to see changes according to lighting conditions and current state of health. The visual perception in visitors with binocular vision dysfunctions is largely affected by the deficits in stereoscopic depth perception, localization of objects and spatial orientation. For visitors with low vision, we cannot assume the ability to work with a regular size print. We also encounter combinations of several vision disorders (e.g. blurred vision, visual field defects, colour vision deficiency or impaired analytical-synthetic visual activity). Visually impaired visitors appreciate the **hands-on exhibitions** that allow them to touch and learn from the exhibits, but due to the difficulty of tactile cognition without simultaneous visual perception, a reasonable time allowance must be set and a limited number of representative objects (max. up to 30) must be carefully selected (*Základy muzejní pedagogiky: Studijní texty 2014; Muzejní edukátor: Studijní materiál* [2019], pp. 232–233). The tactile perception of blind people is based on three-dimensionality. During educational activities, a combination of tactile sensation and voice commentary is most often used, because verbal description alone is too simplistic, reduces stimuli, fatigues attention and requires a **high degree of imagination**. Imagination also plays a significant role in understanding abstract verbal descriptions, as well as in the perception of relief images, which requires a developed power of visualization and abstract thinking. Diametrically different possibilities of interpreting stimuli are available to people who lost their sight during their lifetime, because they apply the visual pattern recognition by retrieving information from their memory. For this reason, it is also advisable to supplement relief images with verbal commentaries (for individual visitors, this arrangement substitutes an audio guide), in which we try to specify the appearance and possible details and we do not avoid specifying the surface and colour (cf. Řížák 2009, p. 24).

+ Important: **Principles of working with tactile exhibits**

When describing an object verbally, we proceed from the whole to the details. If we want to show a certain exhibit to a blind person, we can invite them to run their hand over our hand, which is touching the object. Visitors with residual vision are asked about their options and needs (e.g. whether a large magnification would help them or whether they could take a close look at the exhibit). We should not forget the risk of collision with objects above waist height that protrude into space (e.g. a statue's hand extending beyond the plinth). We carefully draw the blind person's attention to them and thus prevent the risk of injury or damage to the exhibit (*Základy muzejní pedagogiky: Studijní texty* 2014; *Muzejní edukátor: Studijní materiál* [2019], pp. 232–233; Prelovská and Eliašová 2020, p. 84; Michálek and Vondráčková 2015).

As with the use of other senses, each blind person's tactile perception is developed differently, and individual types of tactile sensations are strengthened by practice and **training**. First, the blind person works on achieving sufficient fineness of touch (e.g. being able to handle objects in a loose material, sorting small elements), the ability to recognize individual shapes (this ability is strengthened by training with building kits and geometric shapes), proceeding gradually from larger to smaller ones. This first phase also includes training of the ability to distinguish various sizes of individual shapes and different surfaces and materials (wood, metal, textile, leather, paper, etc.). After having mastered these basic skills, their mutual combination is strengthened and the distinction of relief drawing elements and details on three-dimensional objects is trained so that the sense of touch is gradually improved and automated. Different levels of tactile competence can be used appropriately in educational activities, but on the other hand, it is necessary to take into account the possible existence of common and **individual specifics or obstacles to the tactile perception of exhibits**, related to physical, chemical or biological factors. In certain cases (cf. Veithová, pp. 17–19), it may not be feasible or appropriate to employ tactile cognition:

1) medical reasons for which a blind person cannot currently or permanently use their hands for tactile perception (e.g. hand injury, skin disease), does not have the prerequisites for this (e.g. insufficient sensitivity of the fingertips) or lacks the necessary practice (e.g. in people who lost their vision in later life);

2) the choice of an exhibit does not correspond to the possibilities of tactile perception (e.g. when its parameters are below the threshold of sensitivity and discriminability, i.e. the exhibit is too small or consists of a large number of miniature pieces, or, on the contrary, it is oversized and extends beyond the boundaries of a complex tactile perception – e.g. a larger-than-life-sized sculpture);

3) the physical or chemical properties of the exhibit do not allow its sensation by touch (e.g. high temperature, risky surface finish of the object – chemical treatment, surfaces unsuitable for touch; for certain exhibits, e.g. in technical museums, white gloves may be used, which reduce the quality of tactile perception, but at the same time ensure sufficient hand protection);

4) inappropriate location of the exhibit (e.g. it is out of reach, difficult to access or in motion);

5) psychological barriers and a feeling of danger (e.g. stress from the contact with unknown objects), fear of an injury or feelings of displeasure (e.g. a particularly rough surface of an object – e.g. tools and technical aids, or the sensation of an animal);

6) the blind visitors feel tired, unfocused or disinterested (tactile cognition should be understood as an opportunity, not an obligation of a blind person), or they are not provided with adequate facilities for hygiene and hand care (dirt clinging to the hands, the sink is not within easy reach, there is no possibility to wash hands continuously during tactile cognition).

+ Important: **How to properly use the terms haptic vs. tactile**

It is not only in the museum exhibition and education practice that we can encounter an incorrect use of terms which are meant to reflect the work with three-dimensional objects and tactile cognition. One of the means that humans use to learn about the material world with tangible (haptic) objects all around them is touch – a tactile sense through which tactile cognition takes place. The term tactile is used internationally to mean getting to know something by touch and using touch as a means of receiving information. So, the term “haptic” should be understood as tangible (i.e. object) and the term “tactile” as conveying information by touch (i.e. sense) (Jančo 2013, p. 41; Smýkal 2018, p. 167).

In addition to the engagement of standard tactile cognition, it is also appropriate to provide information and stimuli for other functional senses. Blind visitors will appreciate active thinking-based learning as well as direct involvement in other creative and hand-crafted activities. The educational programme should build on a wider spectrum of activities, not leave the blind in the role of mere consumers, but offer the possibility of active creation. Due to the wide range of interests and a positive relationship of some blind people e.g. to music and visual arts, as passive listeners/users but also as active musicians and artists, it is advisable to include the activities related to music production and own artistic creation (in more detail Smýkal 2018).

+ Interesting: **Art of the blind**

One of the current options for artistic activities of the blind is the so-called Axman Modelling Technique (ATM) of three-dimensional works of art, which is the result of a long-term research by the Slepíši association. This technique is based on tactile principles and individual craft skills of the author and is applied when working with clay in the creation of three-dimensional works of art (objects), which are made without vision corrections. This method was developed by Štěpán and Tereza Axman, who teach it at the ATM International Centre in Tasov in the Vysočina Region in the Czech Republic, and have also organized a number of exhibition projects to present these works. Other suitable art techniques include a painting method developed by the academic painter Dino Čečo. First of all, a layer of lava black colour is applied on non-woven fabric underlaid by plastic film and then an adequate piece of canvas in frame is put on top. Afterwards, a tool (e.g. a knitting needle or a thimble) is used to draw. By pushing the tool against the canvas, black colour soaks through the white background and individual strokes subsequently emerge in low relief, so that the blind author can touch the resulting work. It is also possible to make a relief drawing, where the author uses a ballpoint pen to emboss the drawing into soft paper on a hard cardboard base, controls the movement of the drawing hand with the other hand, and checks the embossed relief on the reverse side of the paper (for more details, see Raková 2017).

Conclusion

Museums of the 21st century become more and more open to the public, and their visitors are not just passive observers, but active participants in the creation of accompanying programmes, exhibitions or research projects, thus promoting the two-way communication between the museum and the public. Contemporary museums are almost automatically expected to have an inclusive approach to the diverse needs of a wide range of visitors. Such museums meet the requirements for a participatory institution, where even blind visitors come and return with pleasure. We are well aware that the starting position of individual museums is not easy – many are faced with irremovable barriers resulting from their location in historical buildings, limited possibilities of making appropriate building alterations or insufficient financial and material resources. Also, the museum workers may show a lack of understanding, lack of competence or a concern about changing the established order in exhibition and education activities. We understand that listening to the needs of blind visitors requires a lot of effort, adequate competences and overcoming many obstacles. Therefore, do not be afraid to start from the basics and make changes beginning from small things.

Be inclusive and search for ways to remove barriers. Where not possible, there a sufficient information and the initial searching for at least temporary solutions will also be helpful. Debarriering of your museum will be appreciated not only by blind people but also by other groups of visitors with special needs.

Who else but you. The museum educator is expected to be the museum's greatest expert in the field of education of and communication with, blind visitors. Study the basic information about the blind and the possibilities of working with them, prepare carefully and don't be shy to verify your knowledge in practice at an appropriate opportunity.

When in doubt, ask blind people directly and consult with experts. This way you avoid well-intentioned but unnecessary mistakes. You can contact local branches of organizations of the blind and visually impaired people, specialized educational facilities, professional organizations and methodical centres in museum sphere, or specialized museums for cooperation. You can communicate your experience to colleagues from other museums at conferences and strengthen your professional skills at specialized workshops.

We wish you plenty of energy and success in making museums accessible to blind visitors, and we believe that you will find an appreciative audience in them. Should you be interested in sharing your experience, do not hesitate to contact us and our department with confidence.

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Blind museum visitors: methodical tips for museum presentation and education

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