SUMMARY OF THE PROFESSIONAL ACCOMPLISHMENTS

1. **Name and surname**

   Piotr Paweł Woźniak

2. **Diplomas and academic degrees**

   2001 obtaining a PhD degree in Earth Sciences in the field of geography; University of Gdańsk, Faculty of Biology, Geography and Oceanography; dissertation titled „Deglaciation processes of the Last Glaciation in the south-eastern part of the Krajna Plateau", supervisor: Prof. Roman Gołębiewski

   1992 sitting the master's examination and obtaining a five-year geography MSc degree, specialisation: geomorphology and Quaternary palaeogeography from the University of Gdańsk, Faculty of Biology, Geography and Oceanography; dissertation titled „Geomorphological questions of the marginal zone in the eastern part of the Bytów ice-lobe", supervisor: Prof. Bogusław Rosa

3. **Information on employment in academic institutions**

   since 2016 University of Gdańsk, Department of Geomorphology and Quaternary Geology, research assistant

   2012-2016 University of Gdańsk, Department of Geomorphology and Quaternary Geology, senior lecturer

   2001-2012 University of Gdańsk, Department of Geomorphology and Quaternary Geology, assistant professor

   1992-2001 University of Gdańsk, Department of Geomorphology and Quaternary Geology, research assistant

4. **Scientific achievement being the basis for the habilitation procedure** (in accordance with Article 16 paragraph 2 of the Act on Academic Degrees and Academic Titles as well as Degrees and Titles in Art as of 14th March 2003; Journal of Laws 2016, item 882, as amended in Journal of Laws 2016, item 1311):

a) Title of the scientific achievement:
   The set of 6 papers entitled:
   title in Polish:
   Wykorzystanie cech teksturalnych i strukturalnych glin glacjalnych i debrytów subakwalnych do wnioskowania o kierunkach paleotransportu i cechach środowiska depozycyjnego

   title in English:
   Use of the textural and structural properties of tills and subaqueous debrites for the conclusions concerning palaeotransport directions and properties of depositional environment

b) Authors, titles of publications, year of publication, publisher:
   The scientific achievement being the basis for the habilitation procedure consists of six peer-reviewed papers [A1]–[A6], prepared after I was granted the PhD degree and published in the last four years (2015–2018). Five of them have been published in journals included in the JCR database, while the sixth one has been published in a journal included in the List B of the Ministry of Science and Higher Education (MSHE). I am the leading author with the majority of contribution to the five of them ([A1]–[A4] and [A6]) and co-author of equal status with the contribution to the remaining one [A5]. My contributions to the papers are declared in Appendix no. 5 in accordance with the co-authorship statements (Appendix no. 4).

[A1] Woźniak P.P., Czubla P., 2015. The Late Weichselian glacial record in northern Poland – towards a wider perspective: a new look at debris transport routes by the FIS, Quaternary International, 386: 3–17.
The score acc. to the MSHE list: 30 pts.; IF_{2015} – 2.067; $IF_{5\text{-year}}$ – 2.383; number of citations acc. to the Web of Science database: 5; number of citations acc. to the Google Scholar database: 17

[A2] Woźniak P.P., Czubla P., 2016. Unravelling the complex nature of the Upper Weichselian till section at Gdynia Babie Doły, northern Poland. Geologos, 22, 1: 15–32.
The score acc. to the MSHE list: 14 pts.; number of citations acc. to the Google Scholar database: 7

[A3] Woźniak P.P., Czubla P., Domachowski W., Świrydo M., 2017. Directional properties of glacial relief and sediments as an effect of multi-stage evolution: case study of the Tczew Hump, northern Poland. Quaternary International, https://doi.org/10.1016/j.quaint.2017.09.033: 12p.
The score acc. to the MSHE list: 30 pts.; IF_{2016} – 2.199; $IF_{5\text{-year}}$ – 2.470; number of citations acc. to the Web of Science database: not included; number of citations acc. to the Google Scholar database: 1

[A4] Woźniak P.P., Pisarska-Jamroży M., 2018. Debris flows with soft-sediment clasts in a Pleistocene glaciolacustrine fan (Gdańsk Bay), Poland. Catena, 165: 178–191.
The score acc. to the MSHE list: 35 pts.; IF_{2016} – 3.191; $IF_{5\text{-year}}$ – 3.777; number of citations acc. to the Web of Science database: 0; number of citations acc. to the Google Scholar database: 2

[A5] Pisarska-Jamroży M., Woźniak P.P., 2018. Debris flow and glacioisostatic-induced soft-sediment deformation structures in a Pleistocene glaciolacustrine fan: The southern Baltic Sea coast, Poland. Geomorphology, https://doi.org/10.1016/j.geomorph.2018.01.015: 14p.
The score acc. to the MSHE list: 35 pts.; IF_{2016} – 2.958; $IF_{5\text{-year}}$ – 3.357; number of citations acc. to the Web of Science database: not included; number of citations acc. to the Google Scholar database: 2

[A6] Woźniak P.P., Pisarska-Jamroży M., Elwirski Ł., 2018. Orientation of gravels and soft-sediment clasts in subaqueous debrites – implications for palaeodirection reconstruction: case study from Puck Bay, northern Poland. Bulletin of the Geological Society of Finland, advance online publication: 1–14.
http://www.geologinenseura.fi/bulletin/In_Press/Wozniak_etal_inpress.pdf (DOI in BGSF appointed to the articles only after a complete volume has been prepared for publication).
The score acc. to the MSHE list: 20 pts.; IF_{2016} – 0.500; $IF_{5\text{-year}}$ – 0.892; number of citations acc. to the Web of Science database: 0; number of citations acc. to the Google Scholar database: not included

Summarised factors of the scientific achievement:
IF – 10.915, the score acc. to the MSHE list – 164 pts.

c) Scientific objectives, results and applicability of the above-mentioned publications

Use of the textural and structural properties of tills and subaqueous debrites for the conclusions concerning the palaeotransport directions and properties of depositional environment

Introduction

Glacigenic diamictons (tills) are one of the key types of sediments on the areas of Pleistocene glaciations. They prove the ice-sheet presence on a given area and in a given period of glaciation. Their presence helps in stratigraphic sequencing. It is highly helpful if tills are interbedded by sedimentary series of, for instance, fluvial origin, as well as if hiatuses or prominent sediment deformations occur in the studied tills. Simultaneously, textural and structural properties of tills inform about depositional conditions (including ice-sheet dynamics and thermal conditions in its

base). One of the most essential components of diamictons are clasts. They are one of the most important sources of knowledge on palaeotransport directions (petrographic composition, orientation axes, striae); they help in stratigraphic establishment (their petrographic composition) and conclusions about local properties of depositional environment (orientation axes, shape and surface properties of clasts).

Within the group of glacigenic diamictons, we can distinguish those which did not result from direct glacial deposition but are the effect of debris flows of melted-out material. In the traditional glacial geomorphology, these diamictons are regarded as one of lithofacies types of tills, but in the contemporary attempt (particularly in Anglo-Saxon countries) they are recognised as the secondary glacial deposit (Benn and Evans 1998) which lost the original properties of debris in the ice and gained new properties during flowage. Such approach is much better grounded because debris flows of moraine material may occur not only in the subaerial conditions but also in the subaqueous environment. The diamictic deposit of debris-flow origin is called 'debrite' (Zieliński 2014). Similarly to tills, clasts contained in debrites are an important source of information. What is more, debrites contain not only lithic clasts but also soft-sediment clasts (SSC). It is worth devoting a lot of attention to this additional component of debrites because its properties can inform about conditions in a debris flow.

The presented set of papers focuses on two types of diamictons: tills and subaqueous debrites. It could be stated that the presented scientific achievement reveals two main research threads. However, its coherence is based on the fact that both require the same research questions, which concern:

1. the recognition of factors responsible for vertical (in diamicton profile) and horizontal (between sections) diversity of selected textural and structural properties of tills and subaqueous debrites, including:
   a) the spatial range of the factor influence,
   b) the role that a given factor played (primary or secondary),
   c) establishing factor links;
2. the verification of usefulness of the selected analyses of the mentioned diamictons in order to conclude about:
   a) transport directions of different range,
   b) depositional conditions.

Despite the broad spectrum of publications, **the role of factors determining the properties of both types of diamictons is still discussed**. In addition, **new approaches are suggested,** while the conventional, one-sided development is questioned (e.g. types of subglacial till lithofacies – cf. Evans et al. 2006; Piotrowski et al. 2006). However, sometimes a given concept is being copied by various authors, although it is mostly based on a hypothetical model (e.g. of the Baltic Ice Stream model after Punkari 1993). Although the factors determining directional properties of subaerial debris flows are well recognised (e.g. Bertran et al. 1997; Major 1998), **cohesive subaqueous debris flows still need better recognition,** including the answer to the questions regarding the diversity of flow directions in an individual subaqueous debris flow and what this diversity was caused by. What is more, opposite opinions are presented, e.g. regarding the issue of how the rotation in debris flow influences clast ordering (cf. Graveron 1986; Jezek et al. 2013). Depositional mechanisms of debrites, including those in the subaqueous environment, are of a great interest and new models are proposed (e.g. Tripsanas, Piper 2008; Haughton et al. 2009; Talling et al. 2013). Soft-sediment clasts are sometimes mentioned, **but trigger mechanisms of the SSC evolution in debris flows are still poorly described**.

The above-mentioned gaps in the knowledge motivated me to take up new research. Other crucial factors included **the location of the analysed area and the features of a given site**. The northern part of Pomerania **remained under the ice cover over almost the entire Late Weichselian**, while further to the south the ice-sheet dynamics and its extent changed. As a result, the following

[A] – papers from the set being the scientific achievement

question arises regarding the features the record of subglacial deposition in such a situation shows, and at the same time, what to expect in older glaciations and on other areas. The question is important, as most contributions on tills research concentrate in the areas that seem more attractive, i.e. are located close to the former ice-marginal zones. In terms of the research of the subaqueous debrites, the uniqueness of the site proved to be crucial. It was a sedimentary succession of a subaqueous fan with **multiple cohesive debris flows**, with **all critical parts of the subaqueous fan traceable, including its longitudinal cross-section** (parallel to the general debris-flow direction).

The most important research questions in the papers that constitute the scientific achievement being the basis for the habilitation procedure include:

1. **What features does the till profile have if developed in the area still under the ice cover, while further to the south the ice-sheet dynamics and extent were different?**
2. **What does the petrographic composition of till tell about the influence of the ice of different dynamics on the area remaining under the ice cover throughout almost the entire stadial or glacial?**
3. **How soft-sediment clasts in subaqueous debrites diversified and what factors determine this diversification?**
4. **What types of soft-sediment deformation structures are triggered in glaciolacustrine sediments by the deposition of debrites and do they differ from those of seismic origin?**
5. **To what extent are the local directional properties of subaqueous debrite concordant with the general direction of the flow and if diversity is observed – what are the most likely factors responsible for it?**

Scientific objectives and the primary results of publications

[A1] *Woźniak P.P., Czubla P., 2015. The Late Weichselian glacial record in northern Poland – towards a more comprehensive perspective: a new look at debris transport routes by the FIS, Quaternary International, 386: 3–17.*

As indicated by various authors (e.g. Olszewski 1974; Mojski 1981; Drozdowski 1986) and then showed by my preliminary co-authored papers (incl. Czubla et al. 2007; Woźniak et al. 2009), the till in the north-eastern Pomerania, which is the result of glacial deposition during the entire Late Weichselian, reveals the complexity of its vertical profile. The same papers showed the regional diversity of directional properties of the till and suggested diversity of glacial transportation direction, both of local and trans-regional range. It gave rise to the contribution concerning broader area, based on the research in a transect along the Lower Vistula Valley region and the western edge of the Gdańsk Bay. Its main goals included:

- indicating the processes that led to the development of a till bed of a complex vertical profile,
- analysing the regional diversity of petrographic composition of the Upper Weichselian till,
- comparing local, regional and trans-regional glacial transport directions,
- analysing the directions of the ice flow in various stages of development of the ice sheet in the Late Weichselian,
- verifying the ice-stream model proposed by Punkari (1993) concerning the activity of the southern part of the Fennoscandian Ice Sheet in the Late Weichselian.

The research, based on high-resolution sampling in 8 key sites, enabled documenting along the entire transect the presence of till of a complex vertical profile developed in the ice cover conditions, while in the areas further south the dynamics and extent of the ice sheet was continually changing (cf. Wysota et al. 2009). The Upper Weichselian till in the north-western Pomerania contains clear evidence of the ice-sheet reactivation after its stagnation, probably without releasing the occupied area of the ice cover. The location of studied sections along the transect of ca. 120 km **enabled**

recognising regional changeability of this till; the part at the north-western edge of the Gdańsk Bay differs from the areas along the Lower Vistula Valley region (south of the Gdansk Bay) by (a) more pronounced differences in assemblages of far transported rocks (including the changes in the Theoretical Boulder Centre location) between the subunits of the Upper Weichselian till, (b) a higher diversity of directional properties of these subunits, (c) a considerably lower share of rocks of local provenance. In addition, a distinct link between the petrographic composition of the till and till fabric has been recognised, although the first property better reflects regional and trans-regional ice flow directions, while the second one – mostly a local course. **It was proved that the complexity and geographical diversity of the till profile result from the changes in the ice-flow direction and from the influence of ice of different dynamics (the presence or the lack of a palaeo-ice stream)** during successive phases of the ice-sheet development in northern Poland.

In addition, conclusions of a trans-regional rank have been proposed. The petrographic composition of the examined tills (including a high content of rocks from Småland, and the presence of rocks from Bornholm and Skane) contradicts debris delivery to the eastern Pomerania only along the longitudinal axis of the contemporary Baltic Sea (i.e. by the Baltic Ice Stream). It would mean crossing of the Baltic Ice Stream and the debris delivery routes from southern Sweden and Bornholm. It seems, thus, that **the concepts of the Baltic Ice Stream and other palaeo-ice streams beginning in the deep interior of the Fennoscandian Ice Sheet have to be revised. In the opinion of the authors, these palaeo-ice streams were shorter, and their activity was limited to short periods of time.**

The research shows that the petrographic composition of erratic material may be conditioned not only by the relation of transport paths to the source areas of rocks but also by the thermal regime of the ice-sheet's base in these areas. In addition, **it was proved that debris delivery might have been complicated and multi-stage, and lasted longer than one phase of the ice-sheet development; moreover,** redeposition of older glaciation deposits should also be considered. The conclusions drawn for the Late Weichselian tills **reveal distinct versatility**. They can also be extended to other glaciated areas (if in a similar relation to the ice-sheet extent as in the area presented here) and over different glacial periods (which is documented in the paper as well).

[A2] *Woźniak P.P., Czubla P., 2016. Unravelling the complex nature of the Upper Weichselian till section at Gdynia Babie Doły, northern Poland. Geologos, 22, 1: 15–32.*

The paper concerns questions similar to the above-presented contribution [A1]. However, it focuses on the local diversity of the till profile, based on the study in a site located in the northern part of the analysed transect and in the hinterland far from the recent ice-sheet margin during the Pomeranian Phase. In this site a unique sediment profile can be seen: it starts with the record of subglacial deposition of two subunits of basal till, followed by glaciofluvial and paralimnic sediments deposited during the decay of the ice cover, and covered by a clast-supported diamicton of gravity flows from dead-ice blocks. The primary goals of this contribution included the identification of the processes that led to the development of the till profile of a complex vertical structure and the establishment of the rank and the scope of impact (temporal and spatial) of the factors responsible for the properties of the basal till subunits. In addition, the research was an opportunity to indicate what methods are best to use in the study of a till profile of such complexity and if the results of the analyses lead to the same conclusions.

The record of the palaeo-ice flow reactivation is documented, as well as the change of the ice-flow direction after this reactivation. It is reflected in a dichotomy of the basal till, as two recognised subunits differ by (a) the colour, (b) petrographic composition of far transported rocks, (c) the share of rocks of local provenance, (d) the local direction of palaeo-ice flow deduced from the till fabric. **The conclusions based on the analyses of different properties reveal a distinct similarity**, including the analyses of petrographic composition of both far transported rocks and rocks of local

provenance, and the analyses of clast orientation. The distinct diversity of the till subunits is a consequence of changes to the inflow of palaeo-ice masses: the lower subunit resulted from the inflow of the palaeo-ice stream that moved along the longitudinal axis of the Baltic Sea and then expanded to the areas adjacent to the depression of the Gdańsk Bay (inflow from NE); the upper subunit formed when the impact of the paleo-ice stream diminished in the discussed area, and the dominant role was taken over by the flow of ice from the NW. **These results shed a new light on the Late Weichselian palaeo-geographic conditions at the western edge of the Gdańsk Bay, and simultaneously they support conclusions concerning dynamics and directions of paleo-ice flow in the eastern Pomerania** presented in the above paper [A1].

The research documented not only the vertical complexity of the till profile, but also a considerable variation in the characteristics of lithofacies in the horizontal orientation at a small distance (few metres), **which confirms the concept of the mosaic nature of subglacial conditions of glacial sedimentation**. We recognised the diversity of the permeability of the deposits over which the ice sheet extended as the primary factor determining such a situation. It conditioned the amount of water at the ice-bed interface and thus the ability to perform the basal ice slip, as well as susceptibility of the sediments to deformation. The conclusion supports previous studies (e.g. Piotrowski et al. 2004; Evans et al. 2006) and simultaneously suggests that a caution should be exercised when the results are generalised, including conclusions about the condition of deposition based on the record in only one section.

In addition, the contribution shows the importance of the recognition of the vertical range and reasons of till weathering. The latter process can positively modify the original petrographic composition of the sediment, which should be taken into account during the analyses of the results. **The paper documents the decalcification process in the base part of the till**, what is rarely noted in comparison to that process being commonly observed in the top part of the till (resulting from the rainwater percolation) and **the reason of this phenomenon is recognised**. In the light of the carbonates content analysed with high vertical resolution in the till profile, as well as inside the till, we suppose that decalcification of its base part is the effect of aggressive rainwater derived from the colluvium cover permeating down the sediment.

[A3] *Woźniak P.P., Czubla P., Domachowski W., Świrydo M., 2017. Directional properties of glacial relief and sediments as an effect of multi-stage evolution: case study of the Tczew Hump, northern Poland. Quaternary International, https://doi.org/10.1016/j.quaint.2017.09.033: 12p.*

This contribution follows the questions presented in both the above papers [A1 and A2]. However, here we documented the record of two phases of ice-flow activity (two till subunits) separated by the period of ice-sheet stagnation without releasing the area from under the ice cover. However, the contribution reveals some peculiarity, as it is not based on the analyses of till properties only, but discusses the links between the properties of till and the features of hills covered by this till as well. The primary goal of the research was to check **the similarity of directions based on the properties of the till and relief, and to recognise the range of glacial transport (local, regional, trans-regional) described by these properties**. In addition, the crucial task was to **answer the question whether the inherited relief influenced the local direction of the ice flow and what the range of that relief modification by the Late Weichselian ice sheet was.** One of the expected results was to establish the stages of the relief formation in the analysed area.

The research showed that the subunits of the Upper Weichselian till, most of all, differ in terms of the share of rocks of local provenance, while the differences in the groups of far transported rocks are not so distinct. The changes are abrupt and well legible – the upper subunit shows up to ten-times increase of the percentage of rocks of local provenance in comparison to the lower subunit. **It suggests uncovering hard bedrock (older than Quaternary) as glacial erosion progressed**, what is

contrary to a trend described in Denmark where, with progressive glaciation and sediment accretion, the ice sheet became increasingly isolated from the rocks at its base (Kjær et al. 2003). In the analysed area, increased erosion was most likely due to the activation of the Vistula Palaeo-ice Stream in the later part of the Late Weichselian.

One of the primary objectives of the contribution was the **analysis of links between the sediment and the relief**. The hills of the Tczew Hump reveal distinct ordering of their crest-line orientation, in general along the main axis of the hump. However, directional properties and morphometric characteristics are not uniform throughout the study area and different systems of crest-line orientation can be distinguished. The hills of the system, concordant with the orientation of the main axis of the hump, are recognised as inherited relief, created before the Late Weichselian and only slightly reshaped by the last ice sheet, despite that the ice-flow direction was distinctly deviated from the hills' crest-line orientation. **The relief of the Tczew Hump reveals a palimpsest nature** with explicit inheritance of original features. During the ice-decay stage (in crevasses) new landforms were added, but they constitute the minority. **These facts show that in general the relief of the Tczew Hump has properties and origin different to the previously presented**. In addition, they suggest that **features of inherited relief may remain the same not only on the areas of the maximum ice-sheet limit** (e.g. in central Poland; cf. Żynda 1967; Roman 2010; Wachecka-Kotkowska 2015), **but also in the hinterland of glaciated area south of the Baltic Sea** (i.e. in northern Poland). Moreover, the research documented **insignificant influence of inherited relief on the local direction of the ice-flow**, which differs from what is usually presented (cf. Wachecka-Kotkowska 2015).

[A4] *Woźniak P.P., Pisarska-Jamroży M., 2018. Debris flows with soft-sediment clasts in a Pleistocene glaciolacustrine fan (Gdańsk Bay), Poland. Catena, 165: 178–191.*

Numerous debrites intercalated with typical silty-sandy and silty-clayey glaciolacustrine sediments were recognised in the sedimentary succession exposed in a cliff at Rzucewo, the Puck Bay. Debrites were deposited on the subaqueous fan, probably during the Middle Weichselian. Changeability of the sediments properties has been traced along the longitudinal cross-section of the fan. This enabled: **(1) reconstructing trigger mechanisms responsible for multiple subaqueous debris flows into the glaciolacustrine basin, (2) recognising properties and changeability of silty, silty-muddy and diamictic soft-sediment clast (SSC) common in subaqueous debrites at the Rzucewo site**.

Cohesive and intermediate clast-rich debris-flows were recognised. Some debrites start at the medial part of the fan, which indicates the **remobilisation of deposited debris-flow sediments**. Their properties mean debrites remobilisation at the medial and distal part of the fan (in comparison to the proximal part), including an increased thickness of some debrites, and by their more sandy lithologies (due to removing of small particles during debris-flow remobilisation and fluidisation). **Debrites recognised in the described sedimentary succession were deposited by subaqueous debris flows of material melted out form dead-ice blocks** located south of the basin, which is deduced from (1) the lack of typical terminoglacial lacustrine sequences, (2) the lack of ice-rafted debris, and (3) the proximal part of the fan occurring opposite of the presumed ice-sheet margin position in this area (north). **A prominent part of the debris-flow material was derived from the remobilisation of unstable glaciolacustrine sediments on the slope, as deduced from the frequent presence of clasts of deposits from the same sedimentary succession** (therefore the described SSC can be recognised as intra-clasts) and from the appearance of SSC of a mega-clast nature. **Two trigger mechanisms might be held responsible for the debris flows on the described subaqueous fan: the instability of the slope caused by a high sedimentation rate, and seismic shocks related to the glacio-isostatic rebound.**

We propose the model of properties and changeability of SSC at a subaqueous fan on the base of the analyses in all parts of the fan at Rzucewo. We concluded that the quantity and morphology of

SSC were determined by the type of debris flow and the transport distance. Grain collision and dispersive grain pressure influenced the disintegration of SSC most intensely in the intermediate clast-rich debris flows. The most significant amounts of small, intact SSC occur in massive gravelly diamictons in the proximal part of the fan, as well as in massive diamictic sands in all parts of the fan. Diamictons and sandy diamictons deposited by a cohesive debris flow in the central and distal parts of the fan contain both intact and contorted SSC. Besides, the most deformed, including rolled as well as most rounded SSC, occur in the distal part of the fan. **We recognised that the number of SSC in the debrites depends not only on the type of the underlying sediments but possibly also the prominent role of the local diversity of debris-flow erosive capability** (erosion of underlying sediments as well as internal erosion in the flow). **We proved that the properties evolution of SSC which occurred in the debris flow is multi-stage.** It is not only determined by the distance of transport, as the debris-flow enrichment in new SSC (including mega-clasts) is also possible in its medial and distal parts.

[A5] *Pisarska-Jamroży M., Woźniak P.P., 2018. Debris flow and glacioisostatic-induced soft-sediment deformation structures in a Pleistocene glaciolacustrine fan: The southern Baltic Sea coast, Poland. Geomorphology, https://doi.org/10.1016/j.geomorph.2018.01.015: 14p.*

The paper illustrates a broad spectrum of soft-sediment deformation structures (SSDS) that may occur in sediments of a subaqueous glaciolacustrine fan with multiple high-density gravity flows. In the studied sedimentary succession at Rzucewo, the following types of SSDS were recognised: (1) various types of fold structures, including fault-propagation folds, (2) load and flame structures, (3) water-escape structures (WES), (4) brittle deformation structures, such as faults (reverse and normal), and fragments of broken-up laminae. **The primary objectives of the present contribution were to reconstruct the development of SSDS in glaciolacustrine fan sediments and indicate trigger mechanisms responsible for their origin**. The fundamental task was to find an answer to the question which SSDS were triggered by the gravity flows of high density (shear stresses triggered by debris flow, overloading of glaciolacustrine sediments by deposited debrite). In addition, we tried **to propose criteria for telling SSDS of such origin from those triggered by seismic tremors due to glacioisostatic rebound**. It was an essential task because the latter trigger is still more frequently recognised as one of the main reasons of the SSDS presence on the formerly glaciated areas (e.g. Brandes et al. 2012; Hoffman, Reicherter 2012; Van Loon et al. 2016).

The obtained results show that **SSDS can be linked to the type of a debris flow: a broader spectrum of SSDS evolves in debris flows of higher strength**. In addition, **the occurrence of SSDS varies in different parts of the subaqueous fan**. Faults, flexures, and (rarely) folds are found in the proximal part. The medial part is rich in SSDS, like plastic deformation structures (load structures, flame structures, folds including fault-propagation folds), WES and brittle deformation structures (normal and reverse faults as well as fragments of broken-up laminae). The distal part of the subaqueous fan shows a similar inventory of SSDS. In this part, plastic deformation structures prevail (load structures, flame structures, folds, flexures) with WES, small-scale faults and fragments of broken-up laminae.

One of the important achievements of the paper is the discussion on the possibility of distinguishing SSDS that evolved as a consequence of debris flows and SSDS developed as a result of a seismic event. A view of such authors as Owen and Moretti (2011), that a set of sediments properties should be recognised to prove a deformation trigger-mechanism, has been confirmed. Moreover, in a situation similar to that described at Rzucewo, simultaneous action of both triggers (debris flows and seismic shocks) might be possible. In conclusion, **the criteria to recognise SSDS of seismic origin were proposed**, concerning SSDS properties (their types, spatial relation to each other,

and their position and extent in a sedimentary succession) as well as properties of the area, where their presence is most probable.

[A6] *Woźniak P.P., Pisarska-Jamroży M., Elwirski Ł., 2018. Orientation of gravels and soft-sediment clasts in subaqueous debrites – implications for palaeodirection reconstruction: case study from Puck Bay, northern Poland. Bulletin of the Geological Society of Finland, advance online publication: 1–14.*

This contribution focuses on directional properties of subaqueous debrites. **Its primary task was to find an answer to the question whether the local directional properties of subaqueous debrite, deposited by the cohesive debris flow, coincide with the general direction of the flow.** In addition, **if no concordance was observed, we tried to indicate the most probable factors responsible for this fact**. This issue is fundamental, as commonly only some parts of given debrite are exposed in an outcrop. In the Rzucewo cliff, all key parts of the subaqueous fan along its longitudinal cross section can be traced. It should be stressed that the conclusions are based on the results from more than one debrite, and on the measurements of both lithic clasts and prolate clasts of rolled mud sediments. In addition, palaeoflow directions based on debrites were compared with the direction of palaeoslope inclination based on dip direction of faults and on palaeocurrents, interpreted from sediments of turbidites and traction currents deposited at the same fan. **The contribution seems to be a pioneering work**, as other research on debrite fabric is mostly based on subaerial debris flows (e.g. Lawson 1979; Bertran et al. 1997; D'Agostino et al. 2010) and experimental flows (e.g. Major 1998; Iverson et al. 2010).

The obtained results show that **due to a longer transport distance a better clast-ordering occurs; however, the highest variability of debrites fabric is observed in the distal part of the fan** (caused by the flat topography of the palaeoslope in which debris-flow lobes split and spread freely in different directions). **The clast a-axis arrangement parallel to the direction of palaeoflow is observed only in the axial part of the debris flow**. During the decelerating and halting of debris-flows, compression processes induced clast rotation and changes of inclination**.** As a result, clast ordering transverse to the palaeoflow direction is typical for the head of a debris-flow lobe. Moreover, in lateral parts of the debris flow clasts commonly show the orientation oblique to the general flow direction (the influence of local stress field in debris flow in contact with unmoved sediment). Splitting of the debris flow into minor lobes, and radial spreading of its head causes **a distinct diversity of local flow directions**. Moreover, the analyses of the rolled and prolate soft-sediment clasts show that in fluidised debrites (deposited diamictic sands) clasts of such kind are rotated **perpendicular to the direction of progressive motion**. As a result, their orientation is perpendicular to the debris-flow direction.

Conclusions based on this study are applicable to both lithic clasts and soft-sediment clasts. The obtained results show that **the individual sets of debrite-fabric measurements indicate only a local debris-flow direction and clast arrangement influenced mostly by the local stress field**. They confirm that the general palaeotransport direction at a subaqueous fan should be based on measurements in different parts of the fan. This is the only way the conformity of mean direction of cohesive debris flows with the palaeodirection from sediments of turbidites and traction currents and with the direction of palaeoslope inclination can be obtained.

Conclusions

The most significant achievements of my publications presented above include the following:

1. Documenting and describing the complex nature of the till profile deposited without releasing the area from the ice cover, while further to the south changes to the ice-sheet dynamics and extent occurred. The conclusions can be extended to other glaciated areas, similarly located in relation to the ice-sheet range as the area presented here, and over different glacial periods.

2. Proving complexity and regional diversity of the till profile, resulting from the changes to the ice-flow direction and the influence of ice of different dynamics (the presence or the lack of a palaeo-ice stream). This achievement also reveals distinct versatility (extendable to other glaciated areas located in relation to the ice-sheet limit similarly to the presented here, and over different glacial periods). In addition, it is proved that for the adequate recognition of a till profile developed in the described situation (what is more, if the thickness of the till is low, ca. 1-1.5 m) a high vertical resolution of sampling is needed, undoubtedly higher than commonly used.

3. Questioning the concept that palaeo-ice streams originated in the deep interior of the Fennoscandian Ice Sheet and moved along a stable route; concluding that debris delivery was influenced by the thermal regime of the ice-sheet bed and that this might have been a multi-stage delivery.

4. Recognising the features of the 'glacial deposit – glacial relief' set in the hinterland of the southern sector of last ice sheet: possible its palimpsest nature, with the diversity of directional properties and with the inheritance of original arrangement; documenting the mosaic nature and the local range of subglacial conditions of the glacial sedimentation, which suggests that a caution should be exercised when the results are generalised, including conclusions about deposition conditions based on the record in only one section.

5. Describing the SSC properties along the longitudinal axis of the subaqueous fan and recognising the trigger mechanisms responsible for their diversity; establishing that the properties evolution of the SSC in the debris flow is multi-stage – it is not only determined by the distance of the transport, as the enrichment of debris flow in new SSC (including mega-clasts) is possible in medial and distal parts of the flow.

6. Tracking the diversity of SSDS developed during debrites deposition along the longitudinal cross section of the subaqueous fan; establishing that the spectrum of such SSDS is comprehensive and that they are commonly similar to the deformation structures of seismic origin; in addition, the criteria to recognise the SSDS of such origin were proposed, because on the areas of relatively low seismic activity (like countries surrounding the Baltic Sea) seismic events caused by glacioisostatic rebound were possible.

7. Conducting pioneering research based on the detailed analyses of directional properties of subaqueous debrites showing that the individual sets of debrite-fabric measurements usually indicate only the local debris-flow direction and clast arrangement influenced by the local stress field; in addition, proposing the interpretation of clast orientation in different parts of subaqueous debrites.

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5. Other academic and research achievements

5.1. Academic activities before obtaining the doctoral degree

My scientific interests began during my geographic studies at the University of Gdańsk, which I took in 1987-1992. The primary impulse was participation in the master's seminar on geomorphology conducted by Prof. Bogusław Rosa, as part of the specialisation in geomorphology and Quaternary paleogeography. Thanks to field work related to the implementation of the master's thesis entitled " Geomorphological questions of the marginal zone in the eastern part of the Bytów ice-lobe" I started the study of glacial sediments and relief, to which I devoted the main part of my academic career. I graduated from Geography with the topmost result in 1992, awarded with the Rector's Award of the University of Gdańsk. In the same year, I was employed as an research assistant at the Department of Geomorphology and Quaternary Geology, University of Gdańsk, where I have worked so far. My scientific interests were still focused on the issues already undertaken in my master's thesis, that is, the problems of marginal zones and geomorphological processes related to the deglaciation of eastern Pomerania. In the following years, I researched these problems mainly in the Krajna Lake District, using various methods to determine the stratigraphic position of the Pleistocene sediments, including petrographic analyses, which were then carried out at the request of another person. Selected research results were presented, among others, in two scientific journals (Woźniak 1999, 2002). At that time, I started research related to cooperation with archaeologists regarding palaeogeographic settlement conditions (Bogaczewicz-Adamczak et al. 1999), further developed after obtaining the doctoral degree. My attention was also drawn to the issue of geographic education at the secondary education level (Woźniak 1994; Sołohubiak-Borchert, Woźniak 1999), which resulted from both several years of cooperation with the Gdańsk Educational Foundation and concerns for future students of geography. The most important effect of my scientific work at that time was the preparation of the doctoral dissertation " Deglaciation processes of the Last Glaciation in the south-eastern part of the Krajna Plateau", written under the supervision of Prof. Roman Gołębiewski. The reviewers of the thesis included Dr hab. Krystyna Kenig and Prof. Józef Edward Mojski. On 6 July 2001, the Council of the Faculty of Biology, Geography and Oceanology of the University of Gdańsk awarded me the PhD degree in Earth sciences in the field of geography. In November 2001, I received the award of the Gdańsk Scientific Society for the outstanding scientific achievements of young researchers in the field of Earth sciences.

5.2. Academic activities after obtaining the doctoral degree

My publishing achievements in the discussed period can be divided into the following trends:

1. Properties of tills, including their petrographic composition and stratigraphic position.
2. Subaqueous debrites and associated deformations of glaciolacustrine sediments.
3. Use of erratic boulders for the reconstruction of deglaciation chronology and their potential for geotourism.
4. Palaeogeography of selected regions and stratigraphy of deposits recognised in these regions.
5. Archaeopetrographic analyses of artefacts and palaeogeographical research in archaeological sites.
6. Conditions and diversity of lacustrine sedimentation.
7. History of the Gdańsk academic centre.

The first two of them cover the topics presented by the cycle submitted as the habilitation achievement. The next two are an extension of these key themes, resulting from the constant interest in glacial sediments, including the possibilities of research on the erratic material as carrying a lot of valuable information in various aspects. The fifth research field is also a consequence of this interest but in the context of the use of Scandinavian material by humans. Studies of lake sediments (the sixth trend) have been one of the leading ones in my department for many years, and I am

happy to note several years of participation in them. The last of these groups of publications is not the result of research interests alone, but constant involvement in the life of the local academic community. This reasonably wide range of research topics results both from many years of work in the academic environment, opportunities created, people met, the opening of new research opportunities and the desire to broaden horizons, as well as the implementation of my various passions.

Properties of glacial tills

After obtaining the doctoral degree and continuing work in the home department, I remained faithful in my scientific interests to the topics related to glacigenic sediments. I paid particular attention to their petrographic composition, thus initiating and developing a new research direction in my department. As part of the improvement of the research workshop, I organised two scientific expeditions to the Baltic countries (2002 and 2003, see Annex 5, point III.L), whose primary effect was the creation of a set of rocks considered as indicative in petrographic studies of glacigenic sediments, extremely important for further research due to the possibility of using reference specimens. The first of my papers, written in the following years, signalled the problem of differentiation of the petrographic composition of glacial tills – regional (between sites), associated with different transport modes of erratic material, as well as vertical (in a given location) – among others evoked by till weathering, including decalcification (Woźniak 2004, 2006). Then, in the area of the Kashubian Coastland and in its vicinity, the first sites documenting the complexity of the profile of the Upper Weichselian till were described (Czubla et al. 2007, Woźniak et al. 2008, 2009). The same papers also pointed to the regional diversification of the directional properties of till and suggested differentiation of glacial transport directions, both locally and at the supra-regional level. The research was carried out, among other things, as part of annual projects financed by the University of Gdańsk (so-called Own Research projects, implemented in 2006, 2007 and 2010, see Annex 5 point III.Q.1.f-h). They were also the starting base for tracking these issues within a plan covering a larger area. I applied to the Ministry of Science and Higher Education for financing such a program in January 2010, and then in July 2010. The first of the applications received a high mark (average score 8 points) but was not approved for financing. The second application was approved for implementation in 2011-2013 [Annex 5, point II.H.2]. It enabled me to research several sites in the transect along the northern part of the Lower Vistula Valley region and at the western edge of the Gdańsk Bay. The results of these studies are primarily the first set of papers supporting the habilitation application ([A1] and [A2]), but also other publications (incl. Woźniak 2014; Woźniak, Czubla 2014a, b) and numerous conference presentations. The latest paper, which also follows this research path, shows how the analyses of till properties, including their petrographic composition, can be used to solve stratigraphic problems, especially in the case of an incomplete geological record (Woźniak et al. 2018).

Subaqueous debrites and associated deformations of glaciolacustrine sediments

My research on glacial deposits on the Kashubian Coastland led to the recognition of sites of glacigenic sediments. One of them, in Rzucewo, turned out to be particularly unique due to the record of the subaqueous fan succession with various debris-flow diamictons (debrites), rich in diverse soft-sediment clasts, and with a unique set of soft-sediment deformation structures. The site was presented during the Sedimentological Workshop in 2014 and the field conference of the INQUA Peribaltic Group in 2016 (Woźniak, Pisarska-Jamroży 2014, 2016), which aroused the great interest of the participants. On the basis of this site, in cooperation mainly with Dr hab. Małgorzata Pisarska-Jamroży, I took up the discussion on various issues, including trigger mechanisms of subaqueous debris flows and differentiation of soft-sediment clasts in these flows, interpretation possibilities of directional properties of debrites, as well as the origin of soft-sediment deformation structures in the sediments accompanying debrites. The publications of the results of these studies are included in the

[A] – papers from the set being the scientific achievement

cycle submitted as a set of papers for habilitation application [A4-A6]. It is worth emphasising that I am still researching this site because further results have a chance to become an essential voice in the discussions on such issues as the interpretative value of the petrographic composition of debrites, as well as factors controlling the shape of large soft-sediment clasts transported by debris flows.

Use of erratic boulders

I devote much attention to my research on erratic boulders. It mainly consists in determining the exposure of boulder surface dating after their melting-out from the ice sheet, mostly with the help of terrestrial cosmogenic nuclides, and binding these results with other geochronological data. They are aiming to obtain a complete chronology of the last ice-sheet recession in Poland, the first research of such a range in Poland. The studies are mainly carried out as part of the project financed by the National Science Centre [Annex 5, point II.H.3] and are based on cooperation with French laboratories (Laboratoire de Géographie Physique, CNRS and Laboratoire National des Nucléides Cosmogéniques, CEREGE). It allowed using a proper recognition of the distribution of potential erratics in eastern Pomerania being the result of my previous work (incl. Woźniak et al. 2015). The project is outstanding in Europe and the first in Poland with such a broad spatial scope and based on such a large number of research objects (initial base: > 500 boulders, 63 of them were selected as optimal for dating). The procedure of this multi-step selection was discussed, among others, in Tylmann et al. (2017). The set of dating results obtained allowed to determine the minimum ages for the maximum extent of the Last Ice Sheet and then the subsequent stages of its recession in Poland (Tylmann et al. 2018). What is more, performed dating based on terrestrial cosmogenic nuclides were connected with the relative dating of erratics' surface exposition based on Schmidt hammer testing, the pioneer study of this type in the area of northern and central Poland (Tylmann, Woźniak 2015). The use of this method allowed for the verification of cosmogenic ages, which is especially valuable in the case of getting much younger ages than expected. The development of the chronology of the last ice-sheet recession in the studied area was possible at the beginning of 2018, only after obtaining the complete set of dating results. The final publications discussing the results are in preparation; this year they will be submitted to journals with a high IF index.

Additional trend in the study of erratic boulders I have carried out is their importance as geotourism objects. In the case of Gdańsk conurbation, the geotourism potential of large erratics is exceptionally high: on the one hand, due to their size and extensive range of values they represent, and on the other – thanks to their location in an attractive tourist area adjacent to a large urban centre, additionally frequented by tourists (Woźniak et al. 2015).

It is also worth noting that in 2017, in cooperation with other members of the INQUA Peribaltic Working Group, I undertook research on the Steidalsbreen glacier (Troms region, northern Norway) based on surface exposure dating of its boulders. The central theme of the study is the discussion on the influence of local conditions on the process of the Holocene recession of a small valley glacier in high latitudes. I am one of the leading contractors of this project, which in 2018 is applied for financing from the University of Gdańsk (Moskalewicz et al. 2018).

Palaeogeography of selected areas and stratigraphy of their deposits

My interest in glacigenic sediments and glacial relief also resulted in palaeogeographic and stratigraphic studies. They mainly concern postglacial regions in eastern Pomerania, and are based on sedimentological research at individual sites; they discuss issues of palaeogeographical development of a given area (Gołębiewski, Woźniak 2003a, b), while some have the character of a monographic study (Gołębiewski et al. 2005). My interests in palaeogeography and stratigraphy also cover areas of older glaciations and new glacial regions. I took part in the development of new results from the site of Rożce, bringing a lot of valuable information, especially for knowledge about the conditions prevailing in the Early Pleistocene in central Poland (Bujak et al. 2016). Relevant

experience was my participation in the study in Roxolany in Ukraine, which is crucial for the Pleistocene stratigraphy in Europe, besides, conducted by an international team of specialists dealing in loess areas. The undertaken research became the basis for verification of the chronostratigraphy of the Middle and Upper Pleistocene of the loess-soil complexes (Fedorowicz et al. 2013b), including dating based on tephra (Fedorowicz et al. 2012, 2013a), and discussions on its origin (Wulf et al. 2016).

Archaeopetrographic analyses of artefacts and palaeogeographical research in archaeological sites

I am willing to use the experience in research of erratic material of Fennoscandian origin and glacigenic sediments in cooperation with archaeologists, mainly from the Archaeological Museum in Gdańsk and National Maritime Museum. I conduct the archaeopetrographic analysis of artefacts (from small tools to boulders) and geomorphological research within archaeological sites [see Annex 5, points II.D.1-3 and III.M.2-4]. I am pleased to note the participation in the NMM's elaboration of a comprehensive, very popular interdisciplinary monograph, of a unique shipwreck (Woźniak 2014a, b). Currently, as part of the project of the Ministry of Culture and National Heritage, I am working on creating a similar final monograph summarising several decades of research of the multicultural archaeological site in Rzucewo, a critical site for Early Neolithic cultures in the Baltic Sea coastlands [Annex 5, point II. H.4]. I also research the sedimentological record of graves reopening [see Annex 5, point III.M.3-4] – an issue that arouses a lively discussion internationally (e.g. Aspöck 2011), but is poorly recognised in Poland.

Conditions and diversity of lacustrine sedimentation

As for many years the research of lake sediments have been one of the leading ones in my department, I also took part in them as a team member, for a few years. Among them, one should distinguish those that were carried out on Lake Druzno. They allowed for a detailed characterisation of recent sediments in the southern basin (Czarnecka et al. 2005), thus creating a valuable, repeatedly cited study documenting changes in the pollution level over the last 150 years and impact of intrusions of the Vistula Lagoon waters for spatial distribution of trace metals in surface sediments of the lake (Tylmann et al. 2007). Besides, one of the studies was strictly application-specific, concerning the fairway across this lake [Annex 5, point III.M.1]. I also took part in the first years of the implementation of a new research problem – systematic searches for laminated lake sediments in the northern Poland, led by Dr Wojciech Tylmann. The use of the comprehensive desk-based selection of the most promising sites meant that field research quickly produced promising results (Tylmann et al. 2006a, b). They were a source of further research, including within the Polish-German project, which I was one of the contractors [Annex 5, pts. II.H.1]. In the following years, however, I diverted from this theme to devote the first attention to glacigenic sediments, among others due to the management of the NCR project [Annex. 5, pts. II.H.2].

History of the Gdańsk academic centre

Many years of involvement in the academic life of the university and the activities of scientific societies prompted me to document the history of the Gdańsk educational centre. I prepared studies on both my department (Woźniak 2009a, b) and the Gdańsk Division of the Polish Geographical Society (Woźniak 2008, 2016). The recent and most extensive of my studies on the operation of the Gdańsk Division of the PGS against the background of the local academic centre is now in print (Woźniak 2018). It is one of the chapters in the monograph that discusses 100 years of existence of the PGS.

Summary

I am the author or co-author of seven studies published in journals from the JCR database (all after obtaining the doctoral degree, total IF = 12.8), fourteen articles published in other peer-reviewed scientific journals (including twelve after receiving the doctoral degree), one monograph (after

obtaining the doctoral degree), 21 chapters in monographs (including 19 after obtaining the doctoral degree), as well as 60 abstracts of conference speeches and posters (53 after receiving the doctoral degree). The total sum of points (according to the current lists of the Ministry of Science and Higher Education) for all published works is 356 (343 points after obtaining the doctoral degree). Visible is the intensification of scientific work and its effectiveness after receiving the doctoral degree, as over 87% of reviewed papers in my portfolio have been published in this period. My publications in journals from the JCR database have so far been cited 20 times. The number of citations of my papers according to the Google Scholar database reached 125. My Hirsch index according to the Web of Science database is 2, and according to the Google Scholar database – 7. An increase in bibliometric indicators of my work is expected shortly because my key papers were published in 2017 and 2018. After obtaining the doctoral degree, I took part in four research projects (including one international) and managed one of them. I was also a contractor or co-contractor for four expert opinions in addition to the mentioned projects. Also, I took part in the implementation of nine (7 after obtaining the doctoral degree) projects financed by the University of Gdańsk (annual Internal Grants of the UG), directing six of them (five after obtaining the doctoral degree). I prepared alone or in cooperation 61 speeches (papers and posters) at academic conferences, including 17 international ones. Personally, I presented 40 of them, including 10 at international conferences. I was invited to speeches at the Polish Geological Institute, at the University of Łódź and at the Gdańsk Scientific Society (5 oral presentations, including 4after obtaining the doctoral degree). During my work after getting the doctoral degree, I was a reviewer of five manuscripts for four scientific journals, and I published one book review in the journal.

Table 1. Summary of the number of my publications

		type of publication			
		papers in journals from the JCR database	papers in other peer-reviewed journals	monographs/chapters in monographs	conference abstracts
number of publications	before obtaining the doctoral degree	0	3	0/2	7
	after obtaining the doctoral degree	7	11	1/19	52
	in total	7	14	1/21	60

5.3. Didactic activities

As an research assistant, assistant professor and senior lecturer, I conducted a variety of classes in the following fields: geography, geology, oceanography, archaeology and environmental protection, both in uniform Master's studies and then in the first and second degree of higher education. They were lectures, classes, laboratory courses and field courses. The most important ones include: "Geomorphology" (geography, five-year studies, then the first degree), "Geomorphology and Quaternary geology" (geology, first degree), "Petrography of Quaternary sediments" (oceanography, second degree), "Introduction to Earth sciences "(archaeology, first degree), as well as lectures for the second degree geography: "Principles of sedimentology", "Methods in geomorphological research", "Methods in field and laboratory research", "Geomorphology of lake district areas". I also conducted classes and field courses in geomorphology (geography, five-year studies, then first degree studies), field specialisation course (geography, five-year and first degree studies), field and laboratory course "Methods in field and laboratory research" and laboratory courses in "Workshop

[A] – papers from the set being the scientific achievement

of research methods" (geography, second degree), "Petrography of Quaternary sediments" (oceanography, second degree), classes for the subject "Introduction to Earth sciences" (archaeology, first degree). For eleven years I have been conducting a bachelor's seminar in geomorphology in the subject of geography, and I am co-running a bachelor's workshop in this field of study. Besides, for nearly twenty years I have been co-running an MSc degree workshop in the field of geography. In the years 2006-2017, 19 master's theses were created under my supervision, and another 45 master's theses in cooperation with other people in the years 2002-2005 [Annex 5, point 3J]. I also promoted 13 people with a bachelor's degree (2008-2017, [Annex 5, point 3J]). I am currently an auxiliary supervisor of one PhD student at the Adam Mickiewicz University in Poznań [Annex 5, point 3K]. It is also worth adding that when I started working at the university and shortly after obtaining the doctoral degree, for a few years I worked at the Gdańsk Educational Foundation as a teacher in junior high and high school. It was a valuable experience, among others, expanding my knowledge about the real competences of people who later began their studies in the field of Earth sciences. One of the effects of involvement in this environment was the development of the concept of an original educational program (Sołohubiak-Borchert, Woźniak 1999).

5.4. Organisational activities and activities popularising the science

I participated in the organisation of 13 conferences, sessions and scientific workshops, including once as a chairman, five times as vice-chairman and once as secretary. Since 2011, I have been operating as part of the INQUA Peribaltic Working Group. I participate in the annual field conferences of the group, and in 2016 I was a co-organiser of such a meeting in Poland. I devote some of my time to scientific societies, above all in the Polish Geographical Society and Gdańsk Scientific Society. I have been an active member of the Polish Geographical Society for over 20 years, and I have been the chairman of the Gdańsk Division of the Polish Geographical Society for four terms. In turn, at the Gdańsk Scientific Society, I am the secretary of the Division of Earth Sciences (fourth term). For over a dozen years I have been dealing with, among others, organisation of open, monthly meetings of the abovementioned scientific societies in Gdańsk. I am also trying to document the history of the activity of Gdańsk Division of the Polish Geographical Society (Woźniak 2008, 2016, 2018). I also actively participate in the work of the Society of Polish Geomorphologists, including engaging in the work of the Commission on Glacial Geomorphology.

As part of the involvement in the functioning of the parent university for two terms, I have participated in the work of the Faculty of Oceanography and Geography Council as a representative of dependent workers, and in 2008-2014 I was a member of the Faculty of Oceanography and Geography Commission on Prizes and Awards. For six years (2008-2013) I worked in the academic advisory team at the Institute of Geography Council, making a significant contribution to the creation and improvement of geography curricula. It is also worth adding that for several years I have been the supervisor of the Student Scientific Organization of Geomorphologists PINGO.

Popularisation of knowledge in the field of Earth sciences is extremely important for me, and is perceived as both a natural duty and pleasure. I created two open exhibitions at the parent institute [Annex 5, III.I.2a-b]: one based on the Collection of Fennoscandian rocks (“Rocks from the Baltic Sea countries, used as indicative material in petrographic analyses of glacigenic sediments and artefacts”); and the second one – “Geomorphological processes record in rocks and sediments” based on specimens I collected during field studies and tourist trips, and examples provided by other people. They were created in 2005 and are successively enriched. On the other hand, in the university campus in the so-called EkoPark, I created a “Geological path – erratic boulders”, presenting with the help of boulders and explanatory tables and plates the geological diversity of erratics in northern Poland, the record of various processes on the surface of boulders, and the use of erratic material by man [Annex 5, point III. I.2c]. Soon, I am planning to provide a website dedicated to these issues. Another opportunity to present this topic was during the events of the

Baltic Science Festival which I have co-organised for several years (2004, 2005, 2007, 2008 and 2010) in Gdańsk, Gdynia and Gniew. This includes lectures, laboratory demonstrations, specimen exhibitions *(„Wandering stones – Swedish rocks in culture, monuments and natural environment of Pomerania", „Wandering stones – Scandinavian rocks in culture, monuments and natural environment of Pomerania" „How the environment changes? Historical and contemporary environment changes", „Environmental changes record in sediments", „Around Manchester"*).In addition, for three years (2008-2010) I supported my colleagues from the Institute of Geography as an coordinator of the Baltic Science Festival.

The popularising activity allows me not only to share my scientific passions but also to pursue my interests also from outside of the scope of Earth sciences. As such, I treat cooperation with the Archaeological Museum in Gdańsk, especially with Danuta Król. It allows promoting knowledge about the use of Fennoscandian rocks in Pomeranian architecture and for making old tools. Together, we organised the exhibition "Swedish rocks in Pomeranian architecture and art" (2004) and a monograph devoted to this subject (Król et al. 2004). Moreover, in the summer of 2018 two educational boards about rock material used in the Neolithic axe workshop will be erected in the Culture Park 'The Village of seal hunters' (Rzucewo). Besides, I support the Archaeological Museum in Gdańsk in the field of petrographic knowledge when preparing information on the so-called 'Monument of the month'. As part of the popularising activities for more general audience, I co-created tourist guides devoted to Gdańsk and the natural environment in its surroundings [Annex 5, point III.Q.3]. Additionally, in 2017 I prepared four educational folders in the field of geography and geology for the Coastland Landscape Park.

I was awarded for the activities in various academic fields: in 2009 by the Polish Ministry of National Education – with the Medal of the National Education Commission, and in 2013 by the President of the Republic of Poland – the Silver Medal for Long-lasting Survey. I was awarded the Memory Medal for the 100th Anniversary of Polish Geographical Society for the activity in this society. Also, in 2012, I received the Medal of Polish Tourist and Sightseeing Society for Help and Cooperation for the cooperation with related societies.

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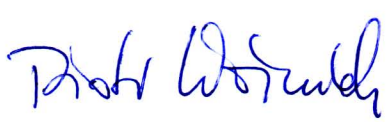

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