



# ЯК ПІДГОТУВАТИ НАУКОВИЙ ПОСТЕР?!

**Доповідач:** старший викладач кафедри відтворення лісів та лісових меліорацій **Г.О.Лобченко**

# ЩО ТАКЕ ПОСТЕР?

- ▶ **Постери (стендові доповіді)**, що презентуються на наукових подіях, широко використовуються для **оприлюднення результатів досліджень**.
- ▶ **Відгуки**, отримані під час постерних презентацій, можуть бути безцінним для **вдосконаленні досліджень** та **підготовки до публікації** у рецензованому журналі.
- ▶ Типова презентація постера виконується в тому ж **форматі**, що й **наукова праця**.

# ЩО ТАКЕ ПОСТЕР?

- ▶ Плакати використовуються для представлення вашої роботи **аудиторії, яка прогулюється** по виставці.
- ▶ **Доповідач** (презентуючий), як правило, **стоїть біля свого плакату**, готовий брати **участь у дискусії** з зацікавленою аудиторією.
- ▶ Таким чином, ваш **постер повинен зацікавити** як і тих, хто знаходиться перед постером, так і тих, кого відволікає шум, натовп тощо.

# ВМІСТ ПОСТЕРУ

## ЗАГОЛОВОК

- ▶ **Короткий.**
- ▶ Здатний **швидко зорієнтувати аудиторію** / дати змогу оцінити ваш предмет і мету.
- ▶ **Не більше 2 рядків** у верхній частині («яскраві», але не смішні).

# ВМІСТ ПОСТЕРУ

## ВСТУП/ПІДОСНОВА

- ▶ **Контекст дослідження** та представлення **гіпотези**.
- ▶ Менше **200 слів** (щоб можна швидко читати)
- ▶ Містити щось цікаве та **«візуально привабливе»**.
- ▶ **Не захарашуйте визначеннями**, довідковою інформацією тощо.

# ВМІСТ ПОСТЕРУ

## МЕТОДИ / ЕКСПЕРИМЕНТАЛЬНИЙ ПІДХІД

- ▶ Коротко, **менше 200 слів**, використовуйте **ілюстрації**, у тому числі блок-схеми.
- ▶ **Без анотації!** Вміст постеру – це і є ваша «візуальна анотація».
- ▶ Орієнтуйтесь на аудиторію: інформація повинна бути **зрозумілою**.

# ВМІСТ ПОСТЕРУ

## РЕЗУЛЬТАТИ

- **2 коротких абзаци** тексту та чітко названі **таблиці**
- Зробіть свої **результати зрозумілими**: більшість пропустить інші розділи і просто вивчатимуть ваші результати
- Пункт 1: вкажіть, **чи працював** Ваш **експеримент** чи ні
- Пункт 2: **проаналізуйте** результати з точки зору Вашої **гіпотези**

# ВМІСТ ПОСТЕРУ

- ▶ Додайте **обговорення** Ваших **висновків**. Приблизно до 200 слів розкажіть читачеві, **чому** Ваше дослідження було **важливим і актуальним**, як в області дослідження, так і в реальному світі.
- ▶ **Нагадайте** читачеві про свій **результат** і чи підтвердилася Ваша **гіпотеза**.
- ▶ Спробуйте **переконати** свого читача, що Ваші результати є **остаточними та цікавими**.



# ВМІСТ ПОСТЕРУ

- ▶ **Перерахуйте** будь-які раніше **опубліковані дослідження**, які були використані. Дотримуйтесь вимог оформлення джерел.
- ▶ Зазначте **вдячність усім**, хто допомагав і підтримував Вас. Не вказуйте посади людей, які підтримували Вас, але вкажіть, яку конкретну допомогу чи підтримку вони надали.
- ▶ Надайте свою **контактну інформацію**. Вкажіть своє ім'я, адресу електронної пошти, веб-сайт і місце, де читачі можуть завантажити копію вашого постера. Можливо, вам захочеться створити **версію** свого **постера**, у вигляді **роздаткового матеріалу**.

# ЯК СТВОРИТИ ПОТУЖНУ ПРЕЗЕНТАЦІЮ?

- ▶ Визначте **розмір постера**. Ви можете передбачити потрібний Вам розмір, розраховуючи кількість тексту, зображень або графіків, які Ви плануєте включити.
- ▶ Перевірте **вимоги** щодо розміру постерів для заходу.
- ▶ Переконайтеся, що **малюнки і фотографії гарної якості**.
- ▶ Ретельно **обирайте, що розмістити** на постері. Постери, які мають **занадто багато тексту, будуть поступатися** на користь тим, які легше читати.
- ▶ Використовуйте **колонки** для організації матеріалу та логічно **структуруйте** постер.
- ▶ **Чітка назва** будь-яких розділів, графіків або зображень.



# ПОРАДИ



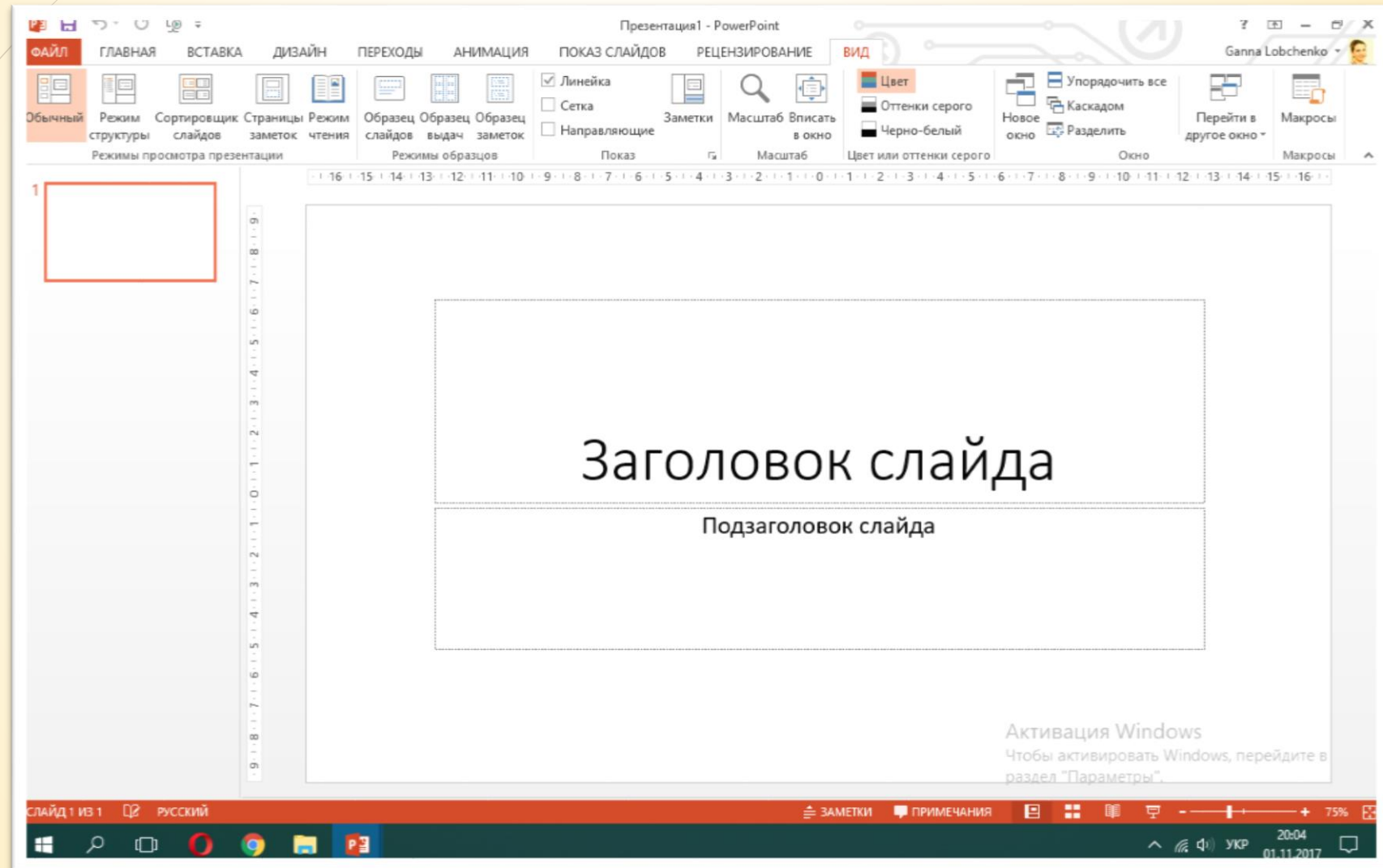
- Складіть **чернетку** Вашого постера. Оцініть, як організована інформація, і чи візуально привабливий постер.
- Зверніться **за відгуком до колег**. Використовуйте відгук для створення остаточної версії.
- **Зберігайте** свій постер безпечно. Ви ж не хочете, щоб Ваша важка праця була марною.
- Передбачте використання **професійних послуг друку**.

# СТВОРЕННЯ ПОСТЕРУ У POWERPOINT



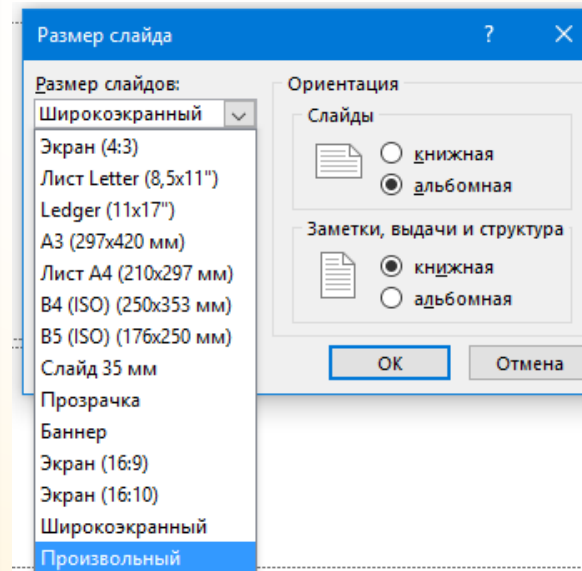
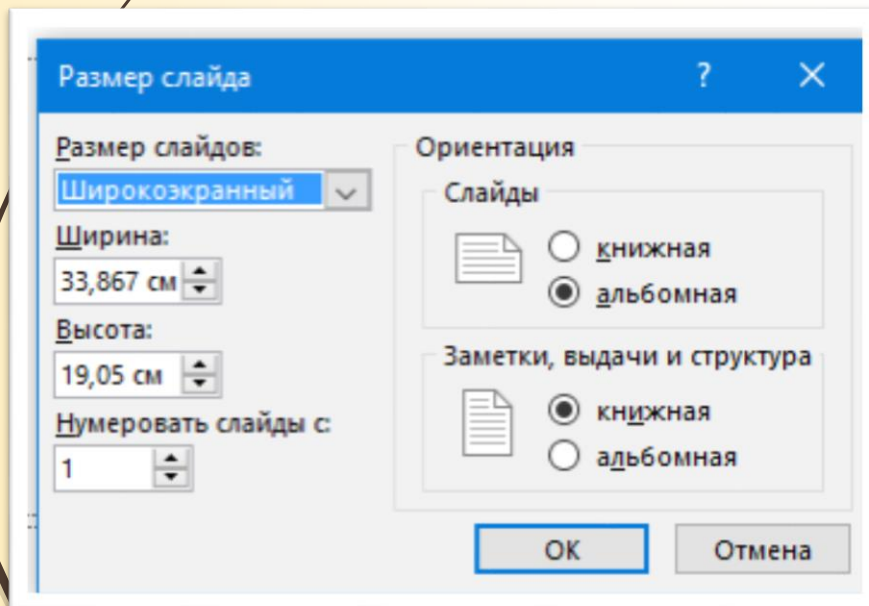
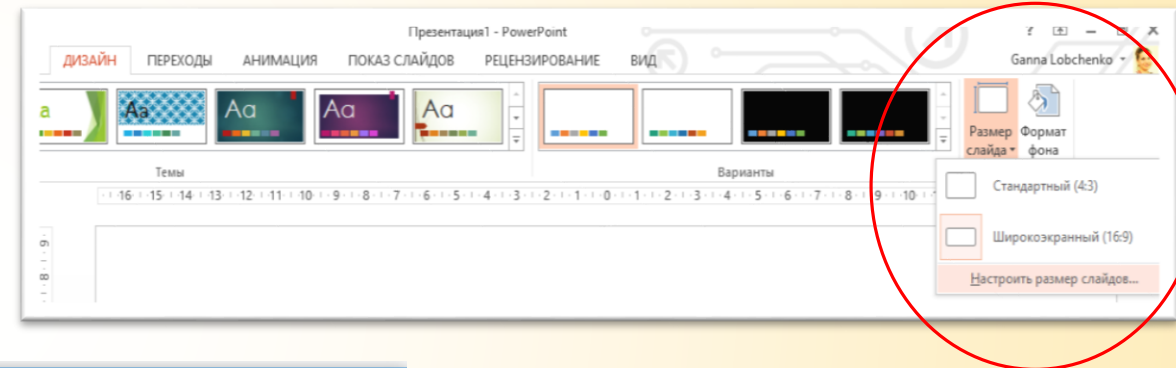
1. Відкрийте PowerPoint
2. Налаштуйте розмір та орієнтацію
3. Відобразіть сітку
4. Застосуйте фон (дизайн)
5. Додайте текст
6. Додайте WordArt
7. Додайте малюнки
8. Робота з Excel

# Відкрийте PowerPoint



# Налаштуйте розмір та орієнтацію

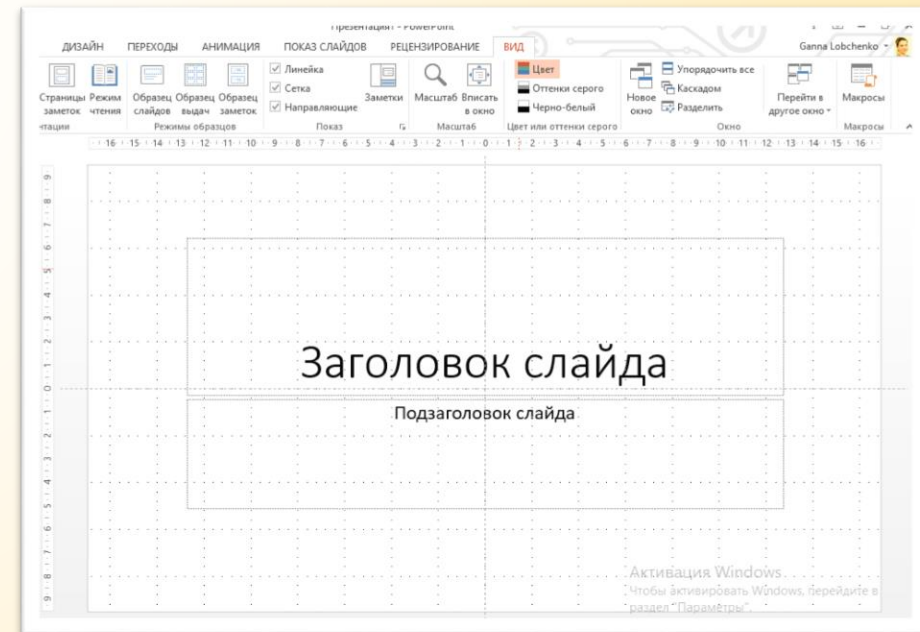
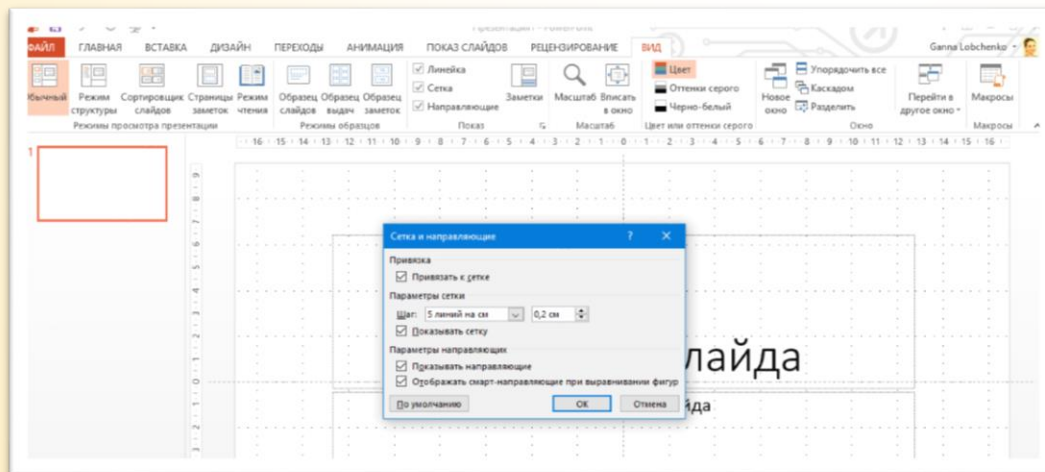
- ▶ Найпоширеніший розмір плаката - **A0** (84.1 см x 118.9 см),
- ▶ Щоб змінити розмір і орієнтацію
  - ▶ Клацніть на вкладці Дизайн на стрічці
  - ▶ Натисніть «Налаштувати розмір слайду»
- ▶ З'явиться діалогове вікно:



- ▶ У меню виберіть «Користувацький»
- ▶ Введіть 84.1 см в ширину та 118.9 см в полі висоти для плаката A0 альбомної орієнтації.

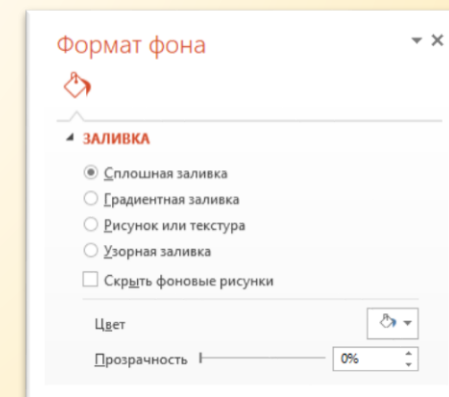
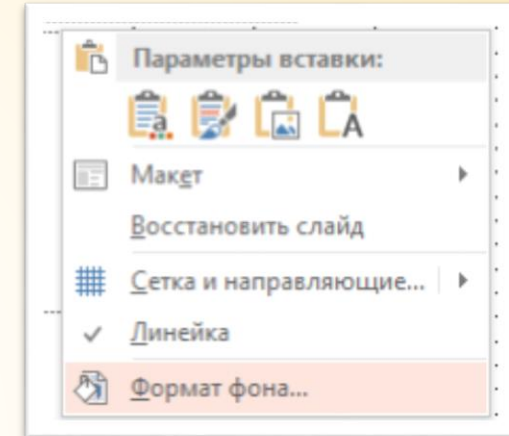
# Відобразити сітку

- ▶ Для розміщення різних елементів постеру, доцільно використовувати сітку, яка допоможе вирівняти зображення та текст.
- ▶ Увімкніть сітку  
У вкладці «Вид» виберіть «Показ».
- ▶ У діалоговому вікні "Сітка та направляючі" залиште інтервал так, як це є, і встановіть позначку у всіх полях.
- ▶ Натисніть "ОК"



# Застосуйте фон (дизайн)

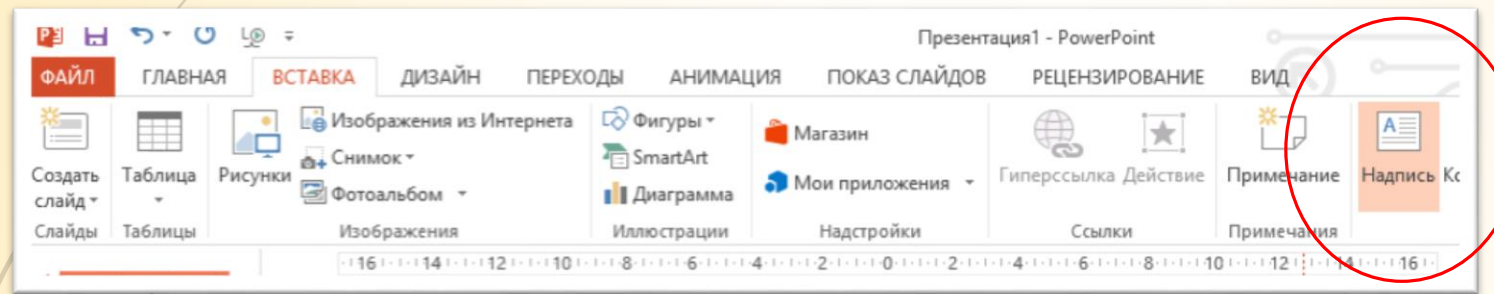
- ▶ Щоб отримати доступ до параметрів для зміни фону
- ▶ Клацніть правою кнопкою миші на слайді і клацніть лівою кнопкою миші «Формат фону»
- ▶ Це діалогове вікно містить **три основні варіанти**
  - ▶ **Суцільна заливка:** застосовується заливка одного кольору на тлі фону
  - ▶ **Градiente заливка:** застосовується поєднання двох або більше кольорів по тлі фону
  - ▶ **Малюнок або текстура:** застосовується один великий малюнок для фону або стандартний фон
- ▶ Не рекомендовано використовувати функцію «прозорості»



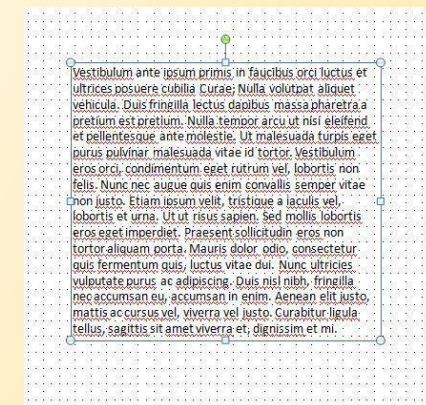
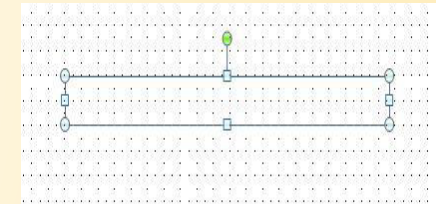


# Додайте текст

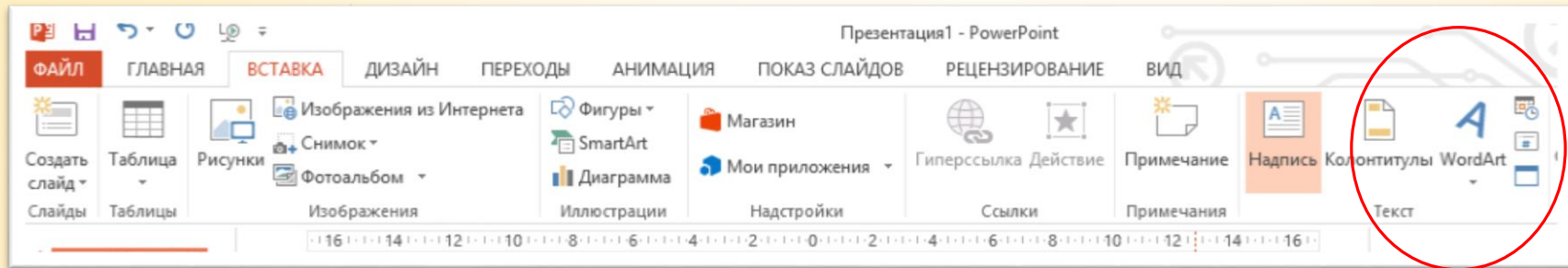
- Натисніть вкладку Вставити
- Клацніть на текстовому полі «Надпис»



- Курсор змінить форму у вигляді довгого хреста
- Клацніть лівою кнопкою миші будь-де на слайді, щоб помістити текстову рамку.
- Клацніть нижній правий кут в текстовому полі, утримуйте та перетягніть його вправо, щоб збільшити його.
- Клацніть у текстовому полі, щоб розпочати введення тексту.
- Ви також можете копіювати та вставляти текст у текстове поле з інших програм.



# Додайте WordArt

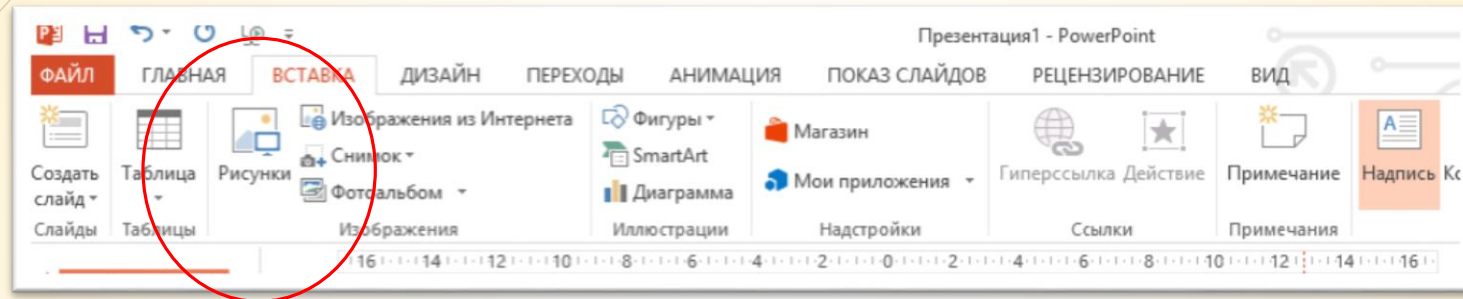


## Поместите здесь ваш текст

- ▶ Натисніть вкладку Формат, оберіть колір/дизайн
- ▶ Щоб змінити шрифт, колір та розмір тексту в текстовому полі, виділіть текст.
- ▶ Всі параметри знаходяться під розділом "Шрифт" на стрічці.



# Додайте малюнки



- Через меню «Вставка»
- Або копіюйте з іншого документу.

# ПРАКТИЧНІ ПОРАДИ

- ▶ **Шрифти:**
  - ▶ Використовуйте шрифти із засічками для текстових частин і без засічок для заголовків.
  - ▶ Не використовуйте надто багато різних розмірів або шрифтів, як правило, не більше ніж два.
  - ▶ Тримайте свій стиль послідовним і простим.
- ▶ **Розмір шрифту:** він повинен бути великим. Текст повинен бути **не менше 18 pt**. **Заголовки** повинні бути від **72 до 144 pt** (72 pt = 1 дюйм). Загалом, робіть підзаголовки 50% від розміру заголовка, а текст - 50% від розміру підзаголовка.

## ПРАКТИЧНІ ПОРАДИ

- ▶ **Акценти:** використовуйте **напівжирний або курсив**. (**Не підкреслюйте**, оскільки це ускладнює читання тексту.) Загалом, уникайте ефектів, наприклад, "затінений" текст.
- ▶ **Колір:** переконайтеся, що Ваші кольори зацікавлюють і не відволікають. Переконайтеся, що ваші кольори доповнюють і додають значення постеру.  
**Не використовуйте більше трьох кольорів.**
- ▶ Для зміни формату файлу перед друком використовуйте онлайн-конвертування із **максимальним розширенням!**

# НЕ ВДАЛИ ПРИКЛАДИ



## Diverging aspects of HDAC inhibitors: transcription and metabolism

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Pharmacology and Cancer Biology, Duke University Medical Center, Durham, NC 27710

Abstract	Results	Results	Conclusion
<p><b>Abstract</b></p> <p>Multiple myeloma is a hematological neoplasm caused by an expansion of malignant plasma B cells. Standard treatment includes corticosteroids, which induce apoptosis of the myeloma cells, but frequently results in resistance. Experimental alternative therapies for myeloma include histone deacetylase inhibitors (HDACi). We find that valproic acid (VPA), an HDACi widely used to treat seizures, efficiently induces apoptosis in myeloma cells. While HDACi can potentiate transcriptional activity of steroid hormone receptors (1), VPA affects myeloma cells independent of glucocorticoid receptor activity and efficiently induces apoptosis regardless of glucocorticoid resistance. HDACi are known to induce apoptosis in hematopoietic tumor cells concurrent with induction of p21 and TRAIL, death ligand (2,4). In addition, HDACi's rapidly reduce mRNA and protein expression of growth factor receptors associated with growth and suppression of apoptosis in myeloma, including interleukin-6 receptor (IL-6R) <math>\alpha</math>, fibroblast growth factor receptor (FGFR) 3, and B cell maturation antigen (BCMA) (2,3,5). However, HDACi have additional activities independent of their role in transcription. HDACi treatment induces the available cellular pool of acetyl-CoA. In response, the cells turn to protein degradation and metabolism of amino acids for energy, decreasing cellular levels of individual amino acids by up to ten fold. mRNAs encoding arginase II and carbamoyl synthetase I (enzymes involved in nitrogen metabolism and nitrogen clearance, are correspondingly induced after 24 hrs of HDACi treatment. Supplementation with additional amino acids increases the induction of apoptosis, suggesting that buildup of nitrogen metabolites of amino acid degradation contributes to HDACi mediated apoptosis. Organic acid analysis of cells following HDACi treatment indicates a significant drop in <math>\beta</math>-ketoglutarate, a key component of the TCA cycle that is also a required intermediate in the metabolism of amino acids and <math>\beta</math>-oxidation of fatty acids. These data together indicate that while HDACi can modulate transcription of select genes, an additional factor to their action is the profound effect on cellular metabolism initiated by a significant reduction in the cellular pool of acetyl-CoA.</p>	<p><b>Figure 2. HDACi treatment rapidly down-regulates mRNA and protein expression of growth factor receptors previously demonstrated to participate in myeloma cell growth and resistance to apoptosis.</b> Three indicated myeloma cell lines were treated 0-24 hrs with 2mM VPA followed by (A) Western blot or (B) real time qPCR analysis of lysates or RNA, respectively, analyzing expression of growth factor receptors demonstrated to be essential for each respective cell line.</p> <p><b>Figure 3. HDACi treatment reduces the cellular pool of available acetyl CoA.</b> (A) Cellular processes that tightly regulate cellular levels of acetyl CoA through its contribution and utilization. (B) OPM2 cells were treated for 44hrs with VPA (2mM), MAA (5mM), butyrate (NaB) (1mM), suberythroid hydroxamic acid (SAHA = 5uM), or Dexamethasone (Dex = 100nM). Cells were lysed by sonication and MS/MS analysis was performed on clarified lysates to determine levels of acetyl carnitine in equilibrium with acetyl CoA. The reduction of acetyl carnitine indicates a significant drop in the normally tightly regulated levels of acetyl CoA.</p>	<p><b>Figure 5. Toxicity of amino acid metabolism in the presence of HDACi suggests a buildup of nitrogen intermediates.</b> (A) Ammonia created through amino acid degradation is cleared physiologically through the indicated pathways. No significant production of urea was measured from HDACi-treated cells in culture (data not shown). (B and C) OPM2 cells were treated for 96hrs with VPA (2mM) in the presence or absence of the indicated compounds. Apoptosis was analyzed as in Figure 1. Increased apoptosis in the presence of VPA and supplemental amino acids suggests a buildup of a toxic nitrogen product. (D) OPM2 cells were treated 24 hrs with the indicated compounds as in Figure 3, and expression of arginase II and carbamoyl synthetase I (enzymes involved in nitrogen disposal) were analyzed by real time qPCR.</p>	<p><b>Conclusion</b></p> <p>HDAC inhibition leads to transcriptional regulation (induction or repression) and changes in cellular metabolism through depletion of acetyl-CoA.</p> <ul style="list-style-type: none"> <li>HDAC inhibitors effectively induce apoptosis in multiple myeloma cell lines as well as myeloma patient isolates (not shown), and their ability to induce apoptosis appears to be proportional to their activity as HDAC inhibitors.</li> <li>In addition, HDAC inhibitors rapidly down-regulate growth factor receptors important for myeloma cell growth and survival, at both the mRNA and protein levels.</li> <li>HDAC inhibitor treatment reduces levels of acetyl carnitine, suggesting a corresponding reduction in the available cellular pool of acetyl CoA that may result in stalling of the TCA cycle and utilization of amino acids by the cell as an energy source.</li> <li>Breakdown of amino acids to salvage the carbon chains for energy forces the cell to dispose of ammonia released by deamination of the amino acids. Myeloma cells utilize both transamination and production of polyamines to sequester the released nitrogen.</li> <li>The contribution of the polyamine pathway may be small, because addition of excess polyamines does not significantly affect cell survival itself or the apoptotic activity of VPA. However, inhibition of the pathway increases the apoptotic potential of VPA, likely because of additional use of transamination.</li> <li>While transamination potentially sequesters the ammonia produced, it depletes the cell of <math>\beta</math>-ketoglutarate, further crippling the TCA cycle and ultimately preventing transamination.</li> <li>Physiologically, amino groups would be incorporated into arginine, glutamine, or alanine, and ultimately converted to urea in the liver. However, the rate of ammonia production that may be occurring in myeloma cells may contribute to the clinical effectiveness observed for HDAC inhibitors.</li> <li>Because cancer cells, as opposed to normal cells, rely primarily on glycolysis for energy and do not significantly utilize <math>\beta</math>-oxidation of fatty acids even in the presence of oxygen, the effect of HDACi on metabolism may ultimately be specific to cancer cells, accounting for the low toxicity observed clinically.</li> </ul>
<p><b>Results</b></p> <p><b>Figure 1. HDACi induce apoptosis in myeloma cells regardless of dexamethasone sensitivity.</b> (A) Multiple myeloma cell lines RPM1 (dex sensitive) and OPM2 (dex resistant) were treated for 96hrs in complete media with the indicated compounds – methoxyacetic acid (MAA), valproic acid (VPA), valpromide (VPM), sodium butyrate (NaB), trichostatin A (TSA), or fumurate. Apoptosis was analyzed by annexin-PE and 7-AAD staining followed by flow cytometry. (B) Lysates of OPM2 cells treated for 24 hrs with the indicated compounds were analyzed for HDAC activity by Western blot analysis of acetylated histone 3.</p>	<p><b>Figure 4. HDACi treatment increases metabolism of amino acids.</b> Lysates from Figure 3B were examined using MS/MS analysis for amino acid content. No significant change in glycolytic intermediates or long chain fatty acids was observed, while a significant reduction in the levels of all 17 amino acids analyzed was evident, four of which are shown below. These findings indicate that OPM2 cells preferentially utilize transamination to replace acetyl CoA.</p>	<p><b>Figure 6. Toxicity of amino acid metabolism in the presence of HDACi suggests a buildup of nitrogen intermediates.</b> (A) Model of transamination, the process by which amino groups are removed from amino acids to allow metabolism of the carbon skeleton. (B) NB4 cells were treated 24 hours with or without 1mM VPA prior to acidic extraction of the cells followed analysis of organic acids.</p>	<p><b>References</b></p> <ol style="list-style-type: none"> <li>Jansen M, Nagel S, Miranda P, Lobenhofer E, Ashkan C, McDonnell D. Short-chain fatty acids enhance nuclear receptor activity through mitogen-activated protein kinase activation and histone deacetylase inhibition. <i>Proc Natl Acad Sci U S A</i>. 2004;101(18):7199-204.</li> <li>Lavelle D, Chen Y, Hankewych M, DeGirone J. Histone deacetylase inhibitors increase p21(WAF1) and induce apoptosis of human myeloma cell lines independent of decreased IL-6 receptor expression. <i>Am J Hematol</i> 2001; 68:170-8.</li> <li>Mareaux J, Legouffe E, Jourdan E, et al. BAF and APRIL protect myeloma cells from apoptosis induced by interleukin 6 deprivation and dexamethasone. <i>Blood</i> 2004;103(8):3148-57.</li> <li>Nebbio A, Clark N, Voltz E, et al. Tumor-selective action of HDAC inhibitors involves TRAIL, induction in acute myeloid leukemia cells. <i>Nature Medicine</i> 2005; 11(1):77-84.</li> <li>Zhu L, Somji G, Zhou B, et al. Fibroblast growth factor receptor 3 inhibition by short hairpin RNAs leads to apoptosis in multiple myeloma. <i>Molecular Cancer Therapeutics</i> 2005; 4(5):787-98.</li> </ol>

# НЕ ВДАЛИ ПРИКЛАДИ



## PIGS IN SPACE: EFFECT OF ZERO GRAVITY AND AD LIBITUM FEEDING ON WEIGHT GAIN IN CAVIA PORCELLUS



SPACEEXES

Colin B. Purrington

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### ABSTRACT:

One ignored benefit of space travel is a potential elimination of obesity, a chronic problem for a growing majority in many parts of the world. In theory, when an individual is in a condition of zero gravity, weight is eliminated. Indeed, in space one could conceivably follow ad libitum feeding and never even gain an gram, and the only side effect would be the need to upgrade one's stretchy pants("exercise pants"). But because many diet schemes start as very good theories only to be found to be rather harmful, we tested our predictions with a long-term experiment in a colony of Guinea pigs (*Cavia porcellus*) maintained on the International Space Station. Individuals were housed separately and given unlimited amounts of high-calorie food pellets. Fresh fruits and vegetables were not available in space so were not offered. Every 30 days, each Guinea pig was weighed. After 5 years, we found that individuals, on average, weighed nothing. In addition to weighing nothing, no weight appeared to be gained over the duration of the protocol. If space continues to be gravity-free, and we believe that assumption is sound, we believe that sending the overweight — and those at risk for overweight — to space would be a lasting cure.

### INTRODUCTION:

The current obesity epidemic started in the early 1960s with the invention and proliferation of elastane and related stretchy fibers, which released wearers from the rigid constraints of clothes and permitted monthly weight gain without the need to buy new outfits. Indeed, exercise today for hundreds of million people involve only the act of wearing stretchy pants in public, presumably because the constrictive pressure forces fat molecules to adopt a more compact tertiary structure (Xavier 1965).

Luckily, at the same time that fabrics became stretchy, the race to the moon between the United States and Russia yielded a useful fact: gravity in outer space is minimal to nonexistent. When gravity is zero, objects cease to have weight. Indeed, early astronauts and cosmonauts had to secure themselves to their ships with seat belts and sticky boots. The potential application to weight loss was noted immediately, but at the time travel to space was prohibitively expensive and thus the issue was not seriously pursued. Now, however, multiple companies are developing cheap extra-orbital travel options for normal consumers, and potential travelers are also creating news ways to pay for products and services that they cannot actually afford. Together, these factors open the possibility that moving to space could cure overweight syndrome quickly and permanently for a large number of humans.

We studied this potential by following weight gain in Guinea pigs, known on Earth as fond of ad libitum feeding. Guinea pigs were long envisioned to be the "Guinea pigs" of space research, too, so they seemed like the obvious choice. Studies on humans are of course desirable, but we feel this current study will be critical in acquiring the attention of granting agencies.

### MATERIALS AND METHODS:

One hundred male and one hundred female Guinea pigs (*Cavia porcellus*) were transported to the International Space Laboratory in 2010. Each pig was housed separately and deprived of exercise wheels and fresh fruits and vegetables for 48 months. Each month, pigs were individually weighed by duct-taping them to an electronic balance sensitive to 0.0001 grams. Back on Earth, an identical cohort was similarly maintained and weighed. Data was analyzed by statistics.

### RESULTS:

Mean weight of pigs in space was 0.0000 +/- 0.0002 g. Some individuals weighed less than zero, some more, but these variations were due to reaction to the duct tape, we believe, which caused them to be alarmed push briefly against the force plate in the balance. Individuals on the Earth, the control cohort, gained about 240 g/month ( $p = 0.0002$ ). Males and females gained a similar amount of weight on Earth (no main effect of sex), and size at any point during the study was related to starting size (which was used as a covariate in the ANCOVA). Both Earth and space pigs developed substantial dewlaps (double chins) and were lethargic at the conclusion of the study.

### CONCLUSIONS:

Our view that weight and weight gain would be zero in space was confirmed. Although we have not replicated this experiment on larger animals or primates, we are confident that our result would be mirrored in other model organisms. We are currently in the process of obtaining necessary human trial permissions, and should have our planned experiment initiated within 80 years, pending expedited review by local and Federal IRBs.

### ACKNOWLEDGEMENTS:

I am grateful for generous support from the National Research Foundation, Black Hole Diet Plans, and the High Fructose Sugar Association. Transport flights were funded by SPACE-EXES, the consortium of wives divorced from insanely wealthy space-flight startups. I am also grateful for comments on early drafts by Mañana Athletic Club, Corpus Christi, USA. Finally, sincere thanks to the Cuy Foundation for generously donating animal care after the conclusion of the study.

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# НЕ ВДАЛИ ПРИКЛАДИ



## The FINANCIAL LOSS to Banks due to WEAK OPERATIONAL PROCESSES of ELECTRONIC BANKING

### Problem Statement

Why do customers face service delays in electronic banking channels which further translate in lost revenue for the bank, when these channels are designed to improve service levels and increase bank revenue?

### Objectives

- To identify types and causes of service delays and downtime (declined transactions)
- To quantify the unrealized loss of revenue to the bank due to a decline in transactions

### Market Research – Highest Decline Reason

Two reasons shared between local banks:

- Host Link Down: 35%
- Host Not Processing: 22%

### Market Research – Solution Prioritization

Message Format: 7%, Account: 25%, Host: 68%

### Market Survey – Customer Awareness

What should banks focus on in order to develop customer confidence for Branchless banking?

- Interactive Marketing: 18%
- Increased Security: 18%
- Branchless Service Awareness Campaigns: 64%

### Market Research – Institution size impact

Do larger banks have a better success percentage in Branchless transactions?

- 41% YES
- 59% NO

### Market Research – Financial Losses

80% e-banking transactions (monthly) are financial

- 6.4% of these fail to materialize due to invalid reasons
- 57% of these failed transactions are Avoidable
- 35% are due to "Host Link Down"
- 22% are due to "Host Not Responding"

### FINANCIAL LOSS CALCULATION

On 1, 2010	Number of Transactions (December 2010)	PKR (Bn)
Total Transactions in December 2010	6,133,000	
Number of Declines (%)	506,440	
Number of Financial Transactions (%)	485,322	PKR 4,658,432
Top 7 reasons for failed declines (57%)	22,628	PKR 2,541,306

### Do you think smaller banks are in a better position to adapt more recent technologies in Branchless Banking?

- 70% YES
- 30% NO

### Rs. 2,541,306 (Banking Industry – December 2010)

### Senior Management is unaware of the opportunity lost due to declines

## The HIV-1 Glycan Shield as a Target for Vaccine Design

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### Background

The gp120 envelope spike of HIV-1 is coated in N-linked glycans, which shield the underlying protein epitopes from recognition by neutralising antibodies. However many of the glycans are of the oligomannose type, which are rarely observed on secreted mammalian glycoproteins. The emergence of a number of broadly neutralising antibodies (bnAbs)<sup>1,2</sup>, which target these 'non-self' glycans, suggests that the oligomannose patch on gp120 represents an immunogenic region that could be targeted in a vaccine context. The main aims of this work were the following:

- Determine the conservation of the oligomannose patch across different HIV-1 clades
- Investigate the stability of the oligomannose patch in response to deletion of individual glycan sites
- Explore the sensitivity of N332-specific bnAbs to glycan site-deletion.

### Results

#### Fig. 1 – Cross-clade conservation of oligomannose.

An effective HIV-1 vaccine depends upon conservation of the target epitope across diverse strains. How variable is the oligomannose population?

A – Narrow phase LTPC profiles of gp120 N-linked glycans. Glycans were released from recombinant gp120 (expressed in HEK293T cells) by treatment with periodate. N-glycosidase T. Hex fluorescently labelled with 2-AA. Oligomannose type glycans are highlighted in blue. B – Cross-clade analysis of oligomannose type glycans. Abundance of individual oligomannose type glycans were measured across a panel of 24 strains. Overall abundances varied between 24-13%.

#### Fig. 2 – Effect of glycan-site deletion on glycosylation.

Escape mutations by HIV-1 often result in deletion of glycan sites. How does loss of a glycan site impact glycosylation and the oligomannose population?

A – Oligomannose class of gp120 N-linked glycans. Predicted class of oligomannose glycans (based on published reports) point variants, predicted class of oligomannose type glycans point deletions. B – Conservation of glycan sites across clades. Data derived from N212 point-deletion series. C – Effect of glycan site deletion on overall abundance of oligomannose type glycans (N212-D9 and N212-D10). N212-D9 and N212-D10 were detected by site-directed mutagenesis. Arrows indicate changes in abundance predicted upon loss of a fully-occupied glycan site.

#### Fig. 3 – Stabilising interactions of individual glycans.

Loss of certain glycan sites were found to have larger than expected destabilising effects on the oligomannose population. Could involvement in particular molecular interactions explain this?

A – Disruption of glycosylation upon loss of the N332 glycan site. The panel shows the N1 glycan profile (black) overlaid with the glycan profile of the N332A mutant (blue). The bottom panel shows the difference plot. B – Molecular modelling of the glycosylated N160. Model based on crystal structure from 4J. The N160 glycan is highlighted with the N332A glycan. C – Disruption of glycosylation upon loss of the N222 glycan site. A. Disruption of glycosylation upon loss of the N222 glycan site. B – 3D ERM binding site. N332 is a conserved domain antibody that binds the CD4 binding site of gp120.

#### Fig. 4 – Glycan promiscuity of N332-specific bnAbs.

Several bnAbs target the glycan at the N332 site. How does removal of nearby glycans affect the processing at this site? What is the effect of recognition by bnAbs?

A – Location of the N332 glycan site. The N332 glycan (in the outer domain of gp120) and is located among a high density of glycans. B – Oligomannose present at the N332 site upon deletion of neighbouring glycans. A highly glycosylated containing the N332 site was purified by IM-AC. The glycanome released, and their abundances, were determined by MALDI-MS. C – ERM data of a panel of N332-specific bnAbs. Unlike targeting the N332 glycan were evaluated for their recognition of glycan-site deletion mutants (N212-D9) relative to additional epitopes for N332. N212-D9 also contains N332D.

### Conclusions

- The oligomannose patch is a highly conserved, cross-clade feature of HIV-1, which is stable upon deletion of individual glycan sites.
- The extremely high density of glycans on gp120 contributes to their limited processing, and reduction of this density can influence processing at nearby glycan sites
- Broadly neutralising antibodies display a degree of promiscuity in their glycan recognition, recognising more than one particular glycoform.
- The conservation and stability of the glycan shield validates it as a target for vaccine design.



# ВДАЛІ ПРИКЛАДИ

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## Assessment of biological productivity of forest in the National natural park 'Holosiivskiy' (based on the hardwood species assessment)

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### Introduction

Forested areas of National natural park «Holosiivskiy» (NNP) play an important role in carbon sequestration and environmental rehabilitation of Kyiv territory. The aim of research is to develop models to be able calculate volumes and components of phytomass of hardwood species (*Q. robur* and *C. betulus*) in the conditions of NNP «Holosiivskiy» forest stands.

### Area of research

National natural park «Holosiivskiy» is situated in Kyiv, Ukraine. The total forest area of the park is 4004,512 ha with the growing stock 1037,95 m<sup>3</sup>. *Pinus sylvestris* (P. sylvestris), *Quercus robur* (Q. robur), *Carpinus betulus* (C. betulus) and *Alnus glutinosa* (A. glutinosa) play the main role in the canopy cover formation.

### Methodology

The most adequate way to estimate phytomass and carbon sequestration of forests is to use large scale data of standing stock and mathematical models. Practical realization of this approach is tightly connected with finding coupling coefficients of phytomass components and stem volume based on experimental data, which characterizes bioproductivity of National natural park «Holosiivskiy».

### Results

#### Model conversion coefficients of phytomass fractions

Model number	Regression model	R <sup>2</sup>
<b>Q. robur</b>		
1	$P_{Q_{100}} = 0.1717368 \cdot V + 0.0004409 \cdot P_{100}$	0,99
2	$P_{Q_{100}} = 0.23427387 \cdot V + 0.0004409 \cdot P_{100}$	0,99
3	$P_{Q_{100}} = 0.2246122 \cdot V + 0.0004409 \cdot P_{100} + 0.0000001 \cdot (V - 0.0000001) \cdot (P_{100} - 0.0000001)$	0,99
4	$P_{Q_{100}} = 0.185274 \cdot V + 0.0004409 \cdot P_{100}$	0,97
<b>C. betulus</b>		
5	$P_{C_{100}} = 0.2246122 \cdot V + 0.0004409 \cdot P_{100}$	0,99
6	$P_{C_{100}} = 0.15427387 \cdot V + 0.0004409 \cdot P_{100}$	0,99
7	$P_{C_{100}} = 0.1717368 \cdot V + 0.0004409 \cdot P_{100}$	0,99
8	$P_{C_{100}} = 0.185274 \cdot V + 0.0004409 \cdot P_{100}$	0,99

#### Biological productivity of hardwood stands in park

Tree species	Q. robur	C. betulus
Area, ha	47,749	21,27
Standing stock, thousand	54,74	47,95
Phytomass		
total, thousand	70,613	20,542
density, kg·m <sup>-2</sup>	13,22	13,45
Carbon dioxide		
total, thousand	30,170	14,029
density, kg·m <sup>-2</sup>	6,50	6,62

#### Components of phytomass



### Conclusions

- Models obtained for the *Q. robur* and *C. betulus* were regression functions with determination coefficients (R<sup>2</sup>) between 0.96 and 0.970. The statistical significance of the results confirms the accuracy of the regional estimates provided by these models.
- An average carbon density on 1 hectare of forest covered land is 6,7 kg·m<sup>-2</sup> for both tree species, which is close to the mean value for Ukraine – 7,5 kg·m<sup>-2</sup>.
- The results of the estimation of the phytomass and carbon dioxide of forest stands of the NPP «Holosiivskiy» will be an important addition to the existing information database of environmental monitoring and can provide the ecologically balanced forest management in the region of research.

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## Assessment and monitoring of Land Cover and Land Use Change (in the Middle Volga Region) (in the Middle Volga Region)

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### Objectives of research

Remote sensing imagery is an integral component in forest cover monitoring within wide areas of forests. There are two main areas in Povolzhje (the Volga river basin) of Russia that require combined remote sensing techniques. First is the monitoring of changes in forest cover (afforestation, reforestation, and deforestation, other activities). Second is the remote monitoring of forest disturbances (forest fires, insect outbreaks) or composition changes in the conditions of climate change.

### The main objectives of the study:

- 1) identification of different classes of land use and land cover, and its spatial distribution in the Volga region of Russia;
- 2) determination of the trends, nature, location and magnitude of forest cover change;
- 3) preparation of maps of forest-cover and land-use change in the study area;
- 4) modelling and prognosis of land-use change.

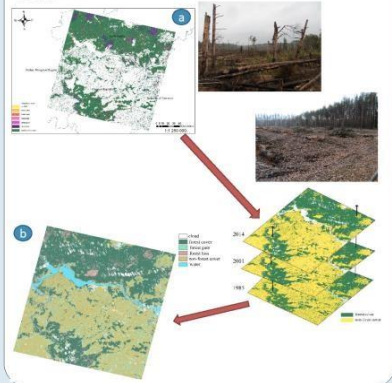
### Area of research



### Monitoring of changes in Land Cover

Scheme for assessing forest cover dynamics in the Republic of Mari El, taking into account the impact of natural and anthropogenic factors.

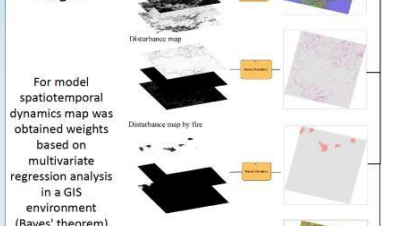
- a) thematic map of disturbance from 1985 to 2014 (fires, forest cutting, drying of spruce forests);
- b) thematic map of forest cover changes from 1985 to 2014.



### Spatio-temporal analysis

The estimation of forest cover dynamics based on remote sensing and GIS data is solved using simulation models that include the spatial and temporal dynamics of the studied landscapes of regional, sub regional and local levels in which forest ecosystems play a dominant role (Mladenoff, 1999, No, 2007). The resulting spatial models of geographically weighted regression can provide a better understanding of the relationship between environmental factors and ecosystem processes in assessing the dynamics of forest ecosystems (Kristen 2000).

### Creating a map weights

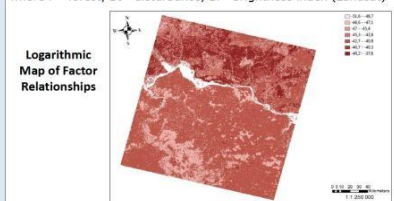


For model spatio-temporal dynamics map was obtained weights based on multivariate regression analysis in a GIS environment (Bayes' theorem)

### Created model of spatio-temporal dynamic of Land Use Change on the example of the Middle Volga Region:

$$LUC = 31.8 \cdot 0.22 \cdot F + 0.46 \cdot Bt + 0.32 \cdot Br + 0.04 \cdot DEM \quad (R^2 = 0.58)$$

where F – forest, Bt – disturbance, Br – brightness index (Landsat)



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## The preservation of the gene pool of *Pinus sibirica* Du Tour by high-yield clones (the South of middle Siberia)

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### Introduction

Siberian cedar pine (*Pinus sibirica* Du Tour) is one of the main forest-forming species of the Russian Federation and performs a lot of essential functions, useful properties and qualities which are valuable for the medical and food industries. Seeds of Siberian cedar pine are characterized by high nutritional and biological quality. This research aims to increase the productivity of the plantation target destination to obtain maximum yield and also for the preservation of the inherited qualities of high-yielding trees, restoration and enhancement of national wealth of pine forests growing naturally in the territory of the Russian Federation.

### Methodology

The methodology of the research is to carry out individual selection among the seed progeny of earlier selected high-yield trees of different geographical origin (80 populations from different growing conditions of distributed area). Breeding sites are located in the area of 50 ha and consists of trees at early stages of ontogenesis (from 40 to 60 years). Verification of genetic value of selected trees is conducted according to the General combining ability of their seed progeny, i.e., comparative analysis of seed progeny of individual trees on indicators correlated with early, abundant seed production. Selected trees reproduced by grafting, because in forestry it is the best way to preserve the genotype of high-yielding trees.

### Area of distribution



### Selected trees by the annual and abundant reproduction



### Clonal Plantation



### Grafted 1-year plants Grafted 45-years plants from different clones



### Results

- The studies were selected the parameters for selecting high-yielding trees of *Pinus sibirica* Du Tour: duration period between yield, the number of cones, macro strobili, micro strobili on the tree, size of cones and their location on the shoot "in bunch" to highlight many-cones forms. Trees on scientific objects were selected by combination of all mentioned features of high productivity and reproduced by seed and vegetative way. In the first stage of growth and development reviewed half-siblings from different families according to biometric indicators, correlated with the accelerated growth and development. Selected trees are genetically valuable with regard to their General combining ability.
- Also in the study of clones of high yielding trees we came to the conclusion that it is necessary to carry out the selection of the grafting components with consideration to their genotype, as it was revealed a significant effect of rootstock on the growth and development of the genetically uniform graft.

### Conclusion

Multiple selection estimation trees on indicators of reproductive development and biometric indicators of their seed progeny and their vegetative reproduction will provide for the rapid production of maximum yields for recovering lost populations, as their genotypes were formed over several centuries through natural selection, the most adapted to the growing conditions of the uterine space.

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