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We are delighted to address you—the brilliant minds driving innovation and intellectual exploration. Your unwavering commitment to advancing knowledge and pushing the boundaries of research is truly inspiring.

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As you embark on this exciting journey, hold onto your curiosity, question assumptions, and never cease to explore. The world eagerly awaits your discoveries, and your work has the potential to create a lasting impact.

With profound admiration for your dedication to knowledge and innovation,

NYCSEA Co-Editors-In-Chief

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The Effect of Building Dams with Concrete Mixed with Burnt Cuttlefish Bone in Wadi Boaboa in The Number of Floods There

Rwda Hagar

Abstract: "Water is life." Since the time of the Pharaohs, Egypt has faced the challenge of flooding. This made it important to take advantage of floods rather than letting them cause disasters. Dams are effective in storing water resources while resisting floods. Therefore, to address the issue of floods, research on the previous solutions should be conducted and the properties of the area that the dam is built on should be addressed. Wadi Boaboa in Wadi El Arish was chosen based on its soil properties, atmosphere, number of floods, and precipitation. It was found that this area was suitable for construction and that it also contained a variety of minerals. The dam has a slightly sloping roadway surface for rainwater drainage. It also includes controlled sluice gates, as well as uncontrolled gates with a circled spillway. The materials of the uncontrolled gates are recycled scrap iron painted to avoid rusting the iron. As this area is a treasure of minerals, so it was decided to build a fish farm in the reservoir lake. In addition, the dam is built of concrete mixed with burnt cuttlefish bone. It was found that burnt cuttlefish bone strengthens the concrete if it is added by a certain amount.

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Phytoremediation of Polyethylene Microplastics in Freshwater Systems

Naya Shah, Katelynn Cai

Abstract: Microplastic pollution is a significant threat to aquatic life and human health, yet sustainable remediation options remain limited. Chlorella vulgaris is a potential alternative due to its ability to produce hydrophobic extracellular polymerase substances, allowing it to bond with the microplastics. There is very limited research regarding the specific role that cell density plays in phytoremediation. This study was conducted to evaluate the effect of varied concentrations of microalgae Chlorella vulgaris on the ability to remediate polyethylene microplastics. Chlorella vulgaris concentrations (15 mg/L, 25 mg/L, and 35 mg/L) were prepared using a hemocytometer-based cell counting assay. The effect of these concentrations on polyethylene microplastic concentration was then evaluated over four days using a spectrophotometer, and a Beer's Law Plot. Fluorescent microscopy was used to observe interactions between algae and microplastics. Results were analyzed using a one-way ANOVA and a Tukey post-hoc ($p<0.05$). 25 mg/L of Chlorella vulgaris was the most effective in microplastic removal ($M=7\times10\text{-}4$g/mm, SD±$3.21\times10\text{-}5$) compared to the control ($p<0.001$). Microscopic imaging revealed that the mechanism of attachment facilitated much of the phytoremediation process. The results demonstrated that Chlorella vulgaris effectively reduced microplastic concentrations, with 25 mg/L being the optimal concentration, possibly as a result of maximal available surface area. The microalgae Chlorella vulgaris showed potential for effective microplastic remediation in aquatic systems. Future researchers may focus on investigating the potential of Chlorella vulgaris in the phytoremediation of other large scale pollutants.

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Interrogating the Spatial-Temporal Balance Between Vascularization and Tissue Formation Through Dynamic Regulation of Thrombospondin-1 (Tsp1) in the Ischemic Fracture Callus

Shirley Jiang

Abstract: Bone fractures are a common injury that is often accompanied by ischemia or broken blood vessels. Blood vessels are essential for bone repair as they supply oxygen to surrounding cells. Thrombospondin-1 (TSP1) is understood to inhibit angiogenesis (blood vessel development). However, the effects of directly inducing blood vessels in an ischemic callus is not fully understood. This study aimed to develop a profile of an ischemic fracture callus in TSP1's absence. We hypothesized that TSP1 inhibition would increase blood vessel density, thus increasing the callus size because fibrosis tissue develops first (before cartilage and bone) and simultaneously with blood vessels. Previously harvested ischemic fracture callus of mice from days 4 were tested for CD31+ (blood vessels). Days 7 and 15, tissues were examined for callus size and matrix (fibrosis tissue, cartilage, and bone formation). Results indicated that TSP1 inhibition was positive for blood vessel, bone, cartilage, and fibrous tissue development within the callus. However, there was a large development of fibrosis tissue on day 7 post-fracture which signified blood vessel development but also the reason for cartilage and bone being delayed at day 15 due to limited space. This study has provided insights into the underlying profile of a fracture callus in TSP1's absence, prompting future research to investigate treatments to prevent heavy fibrosis tissue development for maximum bone healing.

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The Effect of Icorios aselli oleum on the Regeneration of Danio rerio Melanophores

Anisa Sattaur

Abstract: Over 70 million people worldwide suffer from vitiligo, an autoimmune disorder and in the occurrence your CD8+ T cells attack the melanocytes in the skin causing white patches to appear. Cod liver oil has been used before to study bone regeneration as well as tissue regeneration. This study investigates the effect of cod liver on zebrafish regeneration. Zebrafish is an ideal model organism for studying skin diseases because their melanocytes are extremely similar to ones in humans and has been used before to study other skin diseases. In this study there is one control group and 2 experimental groups. The control group will remain untreated as the baseline for the study. Experimental group 1 will treat the fish with cod liver oil and have their stripes removed with neocuproine . Experimental group 2 will just have their stripes removed and left untreated. This study will take a total of 16 days and microscopic evidence will be taken.

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A Comparative Analysis of Indigenous Language Revitalization in Taiwan and Australia

Christian Draven Chung

Abstract: Language suppression has been an issue and a concern for both Taiwan and Australia. Compared to other countries, Taiwan has taken a more assertive and legislatively supported approach to language revitalization. Taiwan's response to preventing language loss has been quite methodical, experiencing stronger reinforcement from legal means and aiding Australia's awareness of their revitalization efforts. In 1788, when British colonization began, Australia witnessed a devastating decline in Indigenous language use, stemming from policies of forced consumption, cultural oppression, and systemic dispossession. At the time of European settlement, approximately 250 Indigenous languages were spoken across Australia. Yet today, fewer than 20 traditional languages remain in use (Marmion et al., 2014). Unfortunately, language loss by the Aboriginal populations is intrinsically tied to cultural erosion, identity struggles, and socioeconomic disparities. Indigenous language revitalization holds greater significance beyond linguistic concerns. Studies show that language is closely linked to mental well-being. Actually, indigenous communities actively using their ancestral language have experienced lower rates of mental health issues, improved education, and a stronger sense of identity. In this respect, the conservation of these languages is not only aimed at protecting cultural heritage but also at promoting the social and psychological well-being of Aboriginal Australians. By taking a keen look at the similarities and differences between the contexts, we can find important strategies that may strengthen the efforts of the countries to preserve their Indigenous languages.

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The Effect of Arthrospira platensis on the Regeneration Rate of Dugesia tigrina

Jimena Machuca

Abstract: Aplastic anemia, a blood disorder that is rare and deadly, affects ~300-900 people in the U.S., with 30 to 40. Although this has specific treatments, there are no treatments from an organic source. As a result of this, the research aims to investigate whether arthrospira platensis (Spirulina) could be a treatment for this disorder using Dugesia tigrina (planaria) as a model, due to stem cells being similar to humans. Therefore, the experiment was done by having a control group (no spirulina) and three experimental groups (spirulina), where their regeneration rate was measured. Additionally, due to time constraints, day 9 for the control group and day 6 for the experimental groups were when the experiment stopped, which led to another limitation, unequal days between the control group and experimental groups. Each group had two sections, the heads section and the tails section, because the planarias were dissected in half. It resulted in the head section in the control group having the highest regeneration rate. Whereas, in the tails section, the experimental group, with a 0.2% spirulina concentration, had the highest regeneration rate. Overall, the hypothesis was deemed inconclusive because the data varied, which means that spirulina has still not been proven or disproven to be an organic option that could improve cell division in this organism.

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Adaptive Haptic Feedback Device for Observing the Delivery of Information in Time-Critical Human-Machine Interfaces

Adithya Patnam , Noah Kay

Abstract: This study introduces an adaptive haptic feedback belt designed to improve situational awareness and information delivery in time-critical human-machine interfaces (HMIs), with a specific focus on aiding visually impaired individuals. By providing tactile feedback through four vibration motors corresponding to angular sectors around the user's body, the belt shifts spatial information into intuitive, real-time haptic cues. The system dynamically adjusts vibration intensity based on the proximity of objects, allowing users to detect and locate obstacles in their environment effectively. Initial tests show the device's ability to communicate crucial spatial information non-visually, offering a promising assistive technology for navigation and obstacle avoidance. The belt's design combines an Arduino-based control system with custom-printed circuit boards (PCBs) and eccentric rotating mass motors (ERMs), optimized for comfort and durability. A 3D-printed mount system secures the motors while providing even vibration distribution. To validate its effectiveness, the prototype was tested in controlled experimental setups, achieving high accuracy in object detection and user satisfaction with comfort and usability. Future applications include integrating the belt into a virtual reality (VR) simulation to train the system for real-world object prioritization using machine learning. By improving situational awareness, the device aims to assist visually impaired users in navigating environments and avoiding obstacles. Subsequent real-world testing hopes to refine this device further, advancing the development of wearable assistive technologies.

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The Effect of Varying Concentrations of Salicylic Acid on the Rate of Infection of Tobacco Mosaic Virus in Solanum lycopersicum

Daniel Zhang

Abstract: Tobacco Mosaic Virus (TMV) reduces crop yields by up to 50% in tobacco and 25-40% in tomatoes. TMV remains a significant challenge in agriculture due to its stability, ease of transmission, and lack of definitive cures. Modern treatments focus primarily on management rather than curing TMV. Salicylic acid (SA) is a critical plant hormone that regulates plant growth, development, and defense mechanisms. This study investigates the effect of varying concentrations of SA on Solanum lycopersicum (tomato plants) to determine its role in mitigating TMV infection. A qualitative and quantitative experimental design was used to assess leaf length, chlorophyll content, and the severity of TMV infection across different SA treatment groups. Experimental data was collected over the span of seven days. Results indicate a concentration-dependent response, with higher SA levels correlating with increased chlorophyll content, reduced TMV severity, and improved average leaf growth, suggesting an enhanced antiviral defense. These findings support SA's potential as a plant defense enhancer, which may contribute to improved crop resilience.

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The Effect of Electrical Stimulation and Boiling Water Treatments on the Germination

Darein Reyes

Abstract: To satisfy food production, Solanum lycopersicum was chosen to evaluate the development of plant growth and germination rate using the combination method of electrical stimulation (ES) and boiling water (BW). This was accomplished using six trials over eight days, where the primary positive control and experimental trials were negatively impacted by the stress of BW at an interval of 5-10 minutes. However, in the secondary positive control trials, the lack of BW led to an increase in plant growth using an electrophoresis chamber at a 35 V (volts) / 1-5 minute stimulation rate. This is shown by the 3-minute ES trial, where the highest average plant growth was 4.9 cm, as opposed to the 2.3 cm average of the control group after eight days of trial.

Because of the control and secondary positive control showing a four-day germination rate, it was concluded that ES can increase plant growth, but not effective germination, due to hormonal and enzymatic changes in the system. This leads to the development of a sustainable 35 V / 1-5 minute interval, which hasn't been used in Solanum lycopersicum electroculture before, despite the refutation that BW and ES as a combination method can impact germination and growth positively.

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Evaluation of Hurricane Activity Using Extreme Value Models for Atlantic Storm Return Period

Yubin Park

Abstract: The peak hurricane season in August and September demands immediate monitoring and response planning to minimize environmental destruction and protect communities. The protection of communities from powerful storms requires ongoing data analysis and improved infrastructure and public education programs for building resilience. The prediction of hurricane behavior faces significant challenges because of its complex data patterns. The complex behavior of hurricane formation and movement and intensity cannot be predicted through basic linear regression or exponential smoothing methods. Accordingly, this research used multiple statistical runs to study hurricane patterns in the United States.

The research applied Extreme Value Theory (EVT) to measure rare and powerful hurricane probabilities through distribution tail analysis. The maximum observed values from EVT calculations enabled researchers to establish return periods for extreme hurricanes. The research showed that hurricanes with lower intensity occur more frequently because their return periods are shorter, and the intense hurricanes become less frequent as storm power increases in power but still present a possibility for occurrence.

Our observation demonstrates that predictive modeling plays a vital role in understanding hurricane patterns and precipitation changes which leads to enhanced readiness for upcoming severe weather events.

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A Novel Decoupling Strategy for Radiofrequency Array Coils in Magnetic Resonance Imaging

Emma Su

Abstract: Magnetic Resonance Imaging (MRI) is a vital diagnostic tool used by radiologists, and image quality is heavily dependent on the performance of radiofrequency (RF) coils. RF coils are important components of MRI scanners as they influence signal-to-noise ratio (SNR), which is crucial for high-quality MRI images. However, coupling, magnetic field interference between coils, can degrade image quality, which may lead to inaccurate identification of cancerous tumors or damaged tissue. Currently, decoupling strategies such as critical coil overlap are employed to minimize coupling, but critical overlap is unrealistic and difficult to attain, and optimal conditions for decoupling remain understudied. Therefore, I aimed to develop a novel decoupling strategy to improve MRI image quality and resolution in a 2-channel RF coil array. I constructed a large decoupling loop, 15 cm by 7 cm, and a small decoupling loop, 11 cm by 6.5 cm; both designed to completely cover the overlap of a 2-channel RF coil array. The SNR was assessed after image acquisition in a 3T MRI scanner. My findings suggest that the large and small decoupling loop sufficiently decoupled RF coils, achieving a high maximum SNR of 492.7 and 445.2 respectively. Overall, these findings suggest that both decoupling loops can minimize coupling and improve image quality in MRI. Future research should explore decoupling strategies for increased RF coil channels and investigate their applicability with human subjects.

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THE EFFECT OF ARACHIDONIC ACID ON THE PROLIFERATION OF DUGESIA TIGRINA NEOBLAST

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Abstract: In 2022, 148.65 billion dollars were spent on wound care in the US. Wound healing is facilitated by cell regeneration and proliferation. Scientists use planaria to study regeneration. Planaria is a flatworm with the ability to grow its body back from small body parts. Arachidonic acid (AA) is a polyunsaturated fatty acid known to stimulate the Wnt pathway, which controls cell proliferation. This study aims to assess the impact of arachidonic acid on the regeneration rate of planaria. 3 planaria heads and 3 planaria tails were placed in regular spring water after bisecting, while 3 planaria heads and 3 planaria tails were placed in an AA solution after bisecting. The planaria were measured daily for 10 days. The data demonstrated that the planaria in the AA solution had a faster regeneration rate, however, they also had a high mortality rate. The higher mortality rate suggested that AA may be toxic to planaria. The planaria with a higher regeneration rate might have needed more energy and nutrients than they had, which could have led to their deaths. The data presented supported the hypothesis that AA increases the regeneration rate of planaria. This research is crucial to understanding how the rate of wound healing can be increased, which can decrease the amount of money spent on wound care in the U.S.

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BUILDING A CONVERSATIONAL AI MEDIUM TO ENHANCE

Michael Petrizzo

Abstract: Psychotherapists in training lack a standardized and formalized method of patient interaction for the proper development of empathy, communication, and experience. Currently, the experience of a resident may include training with other residents where one patient acts as the patient and one the psychotherapist, or with the usage of a simulated patient, an actor, to practice with the resident. Both methods have shortcomings in availability, reliability, and the accuracy of the patient in replicating a real scenario. This project attempted to create virtual patients by utilizing online patient transcripts through the fine-tuning and transfer-learning of three modern Artificial Intelligence models, ChatGPT-4o, LlaMa-3.1v-405B, and Gemini 1.5 Pro; alongside the miniature versions of these models as applicable. This included the creation of a website interface that can interact with the created models for evaluation, while also allowing an interactive format with a simplistic design. The accuracy of the models was independently evaluated through cosine similarities between data and model outputs to find semantic relations, and varied from 92.99% to 83.40%; with ChatGPT-4o Mini and Full having the highest fine-tuned and transfer-learning accuracies respectfully. Furthermore, a customizable model allowed user input for specific descriptions and mental illnesses. This highlights the potential for a model to be successfully representative of a patient which can be utilized to train residents easier than currently available methods. The need for further evaluation and continual training are at the forefront of current limitations.

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Cyberchondria Severity and Self-Esteem in Adolescents Densities

Saahir Afraz

Abstract: TCyberchondria is defined as the obsessive usage of the internet to research health symptoms, often leading to increased health anxiety. (1,2) Additionally, there exists little research between cyberchondria and self-esteem, two constructs that share associations to other conditions such as obsessive-compulsive disorder and health anxiety, in the United States. Globally, there exists a notable gap in adolescent-focused research in this field, and as younger generations are becoming increasingly reliant on the internet, it can heighten their risk for cyberchondria. (3) This study aimed to investigate the association between cyberchondria and self-esteem in suburban American high school adolescents. Data was collected via an online survey distributed through Google Classroom. Participants provided information on sex, grade-level, daily smartphone usage, and number of advanced level classes taken. Following that, the CSS-12 and the Rosenberg Self-Esteem test were conducted to measure cyberchondria and self-esteem levels. Analysis was conducted using the JASP software, with various comparative statistical tests. The relationship between cyberchondria and self-esteem remained significant and prevalent in adolescents. However, none of the demographic or academic variables assessed were significantly related to either construct. These findings contribute to a deeper understanding of how cyberchondria relates to self-esteem in American adolescents, and highlight differences between trends observed in adults, and ones observed in children.

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Investigating the Extent to Which Anatomically-Guided PET Reconstruction Improves the

Thomas Joseph

Abstract: Alzheimer's Disease (AD) is a common neurological disorder that affects the nerve cells in the brain (1). Anatomically guided PET reconstruction (AGR) has been a promising method to improve the quality of amyloid PET images (6,7). While previous studies investigated the AGR method on PET images, it's unclear whether the AGR method improves PET image contrast (7). This study aimed to determine the influence of AGR on the diagnostic quality of Amyloid PET images for AD.

A dataset of 76 volunteers aged 50-87 years old from imaging records from NYU Langone Radiology in Manhattan, NY was investigated. There were no statistically significant differences between the AGR and non-AGR standard uptake value ratios (SUVrs) (Whole Temporal Lobe: p=0.94272; Whole Superior Frontal: p=0.91928; Whole Precuneus: p=0.98383; Whole Hippocampus: p=0.98383; Whole Lateral Occipital Lobe: p=0.98677). These results suggest that the AGR method did not improve the diagnostic quality of the PET image for AD. Future studies should focus on alternative PET image metrics when applying the AGR method to better understand how the AGR method affects the diagnostic quality of the PET image for AD. Keywords: Alzheimer's Disease (AD), PET imaging, neuroradiology, amyloid-beta protein plaque, amyloid PET scan.

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The Effect of Terpineol-Type and Phenol-Type Origanum vulgare on the Locomotion of Dugesia tigrina

Violet Feal

Abstract: Nearly 7 million Americans are living with Alzheimer's Disease. This number is expected to rise in the future. Oregano is known for its anti-inflammatory properties. This means reducing inflammation in the body, such as muscles, nerves, etc. Two compounds in oregano were evaluated for their specific anti-inflammatory properties that model the tension in nerves. Solutions of the compounds were extracted using ethanol for Phenol-Type and methanol for Terpineol-Type. Groups were made separately and combined into three solutions: Terpineol-Type, Phenol-Type, and their combination. These solutions were then exposed to 3 planarians in each experimental group and control group in petri wells, and when exposed after day one, Terpineol-Type was the only experimental group that survived, other than the control group. When microscopically evaluated after six days, nerves were relieved and more defined compared to the control group. The locomotive test after four days showed that the planarians crossed a more significant amount of lines in the Terpineol-Type group than the control group. This concludes that the Terpineol-Type solution relieved the nerve tension and possibly could model a medication for Alzheimer's Disease patients.

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BROKEN MASS INDEX: DEVELOPING AN INCLUSIVE ANTHROPOMETRIC TOOL FOR DIVERSE POPULATIONS

Yael Novak

Abstract: Primary care physicians routinely calculate Body Mass Index (BMI) to assess health risks, but BMI is widely criticized for its inaccuracy and lack of inclusivity—particularly in accounting for racial and gender differences in body composition. These limitations contribute to health disparities by leading to systematic misclassification: some groups are more likely to be over diagnosed or underdiagnosed based on flawed BMI assumptions, which can result in unequal treatment, delayed interventions, and poorer health outcomes. This study introduces the InNova Index, a race-, gender-, and age-specific anthropometric tool developed using NHANES datasets (2015–2016; 2017–2018) and validated against DXA-measured body fat percentage. In Phase 1, InNova models showed strong correlations ($r > 0.900$) across most subgroups, with particularly high accuracy for Asian men ($r = 0.975$), Black men ($r = 0.985$), and Latinx women ($r = 0.985$). All models outperformed BMI, which showed especially weak correlations for Asian women ($r = 0.117$) and moderate performance for most other groups. In Phase 2, age was added to reflect physiological changes over time. Age-stratified models further improved predictive power, with updated InNova correlations, which ranged from $r = 0.899$ to $r = 0.995$ across all age, race, and gender combinations. BMI, by contrast, ranged from $r = 0.117$ to 0.721 across these groups. These findings suggest that the InNova Index offers a more accurate, inclusive, and equitable alternative to BMI. With applications in clinical care, public health screening, and population-level risk assessment, the InNova Index has the potential to reduce health disparities and improve outcomes by better capturing the complexity of human body composition.

Keywords: BMI, health disparities, anthropometric measurement, body composition, racial and gender differences

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Investigating the Immunosuppressive Effects of Nanoparticles on Drosophila melanogaster's Immune Response to E. coli Infections

Jerry Lin

Abstract: The extended duration of allergy immunotherapy, typically three to five years, limits its practicality for many patients. Recent research suggests that nanoparticles may exert immunosuppressive effects, either by delivering immunosuppressive agents or through direct cellular interaction. This project aimed to determine whether nanoparticle exposure could suppress immune gene expression in Drosophila melanogaster, using the antimicrobial peptide gene Diptericin as a marker. RNA was extracted from both control and nanoparticle-exposed flies, followed by reverse transcription and PCR amplification. A spectrophotometer was used to quantify RNA and DNA concentrations, and gene expression was analyzed. T-test results showed a significant reduction ($p < 0.05$) in Diptericin expression in flies exposed to nanoparticles compared to controls, indicating immunosuppression. No significant difference was observed between flies exposed to nanoparticles and those subsequently exposed to E. coli, suggesting that nanoparticle-induced immunosuppression persisted despite bacterial exposure. These findings support the potential use of nanoparticles as suppressors of immune gene expression.

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